THE

JOURNAL

OF

THE ASIATIC SOCIETY

OF

BENGAL.

VOL. I.

THE

JOURNAL

OF

THE ASIATIC SOCIETY

OF

BENGAL.

EDITED BY

JAMES PRINSEP, F. R. S.

SECRETARY OF THE PHYSICAL CLASS, ASIATIC SOCIETY.

VOL. I.

JANUARY TO DECEMBER,

1832.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease."

SIR WM. JONES.

Calcutta:

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1832.

TO

CAPTAIN JAMES D. HERBERT,

Bengal Infantry,

LATE

DEPUTY SURVEYOR GENERAL OF BENGAL, AND SUPERINTENDENT OF REVENUE SURVEYS;

AT PRESENT HOLDING THE APPOINTMENT OF

ASTRONOMER TO HIS MAJESTY

The King of Oude:

WHOSE JUDGMENT ORIGINATED; WHOSE PERSEVERANCE AND EXERTIONS SUCCESSFULLY ESTABLISHED; AND WHOSE SUPERIOR ABILITIES SUPPORTED FOR 3 YEARS,

THE FIRST JOURNAL

IN INDIA

DEVOTED TO THE EXCLUSIVE PUBLICATION

OF

GLEANINGS IN SCIENCE;

THIS VOLUME,

IN ALL RESPECTS, BUT TITLE, A CONTINUATION OF HIS OWN WORK,

IS

Inscribed,

BY HIS ATTACHED FRIEND,

THE EDITOR.

CALCUTTA,
January 1, 1833.

PREFACE.

The Asiatic Society, on the 7th March, 1832*, passed a resolution, that the monthly journal hitherto published under the name of "Gleanings in Science," should be permitted to assume that of Journal of the Asiatic Society, and to continue it as long as the publication remains under the charge of one or both of the Secretaries of the Society. This privilege has, as it was anticipated, been the means of extending very considerably its circulation, while it has given a character and authenticity to the work, by its connection with an institution of established literary reputation, which no anonymous magazine, however well conducted, could hope to command.

The advantages of extended circulation have reacted to the benefit of subscribers, by enabling the Editor to increase the quantity of letter press from 400 to nearly 600 pages; and yet so constant has been the growing support of its contributors, that the pages of the Journal have been devoted, with few exceptions, to the insertion of original communications.

To many readers it would doubtless have been preferable that the Journal should contain more copious extracts from English scientific periodicals, which are not procurable in the interior of India; but conceding that, as an organ of Indian scientific intelligence, it must obviously derive its only merit among the many similar periodicals of the present day, from its stores of *oriental* literary and physical research, it will be generally acknowledged, that the first object of the work should be to give publicity to such oriental matter as the antiquarian, the linguist, the traveller, and the naturalist may glean, in the ample field open to their industry in this part of the world. While acting

* The January number was not published until the middle of March.—Since then exertions have been made to bring up arrears, and in future each monthly number will appear with regularity on the 10th of the following month; the insertion of the meteorological register rendering an earlier issue impossible.

on this principle, however, the Editor has not lost sight of the great utility of following, as far as means would permit, the progress of the various sciences at home, especially such as are connected in any way with Asia; the only limits thereto being want of space, and want of time to peruse and extract from the vast number of publications of the present day. Want of room also precluded the possibility of republishing the proceedings of the Medical and of the Horticultural Societies; but this had become less urgent since both of those useful bodies adopted the excellent rule of giving early publicity to their own proceedings and records.

To the Asiatic Society THE JOURNAL has naturally looked for its most frequent and interesting communications; and in consequence of its more intimate connection with that Institution, the proceedings of that body have been given in greater detail than heretofore, so that absent members may learn exactly what passes at its meetings, and what accessions are made from time to time to its library and its museum. Many absent members have complained of the quarterly subscriptions they were heretofore called upon to pay, while they remained in ignorance of what was going forward; this source of objection is now obviated, and perhaps a still greater amendment may yet be effected for their benefit, by an arrangement that all-members of the Society shall receive a copy of the Journal gratis, which will reduce their annual payments nearly one fourth.

It is unnecessary to recapitulate the contents of the present volume, or to allude in anonymous praise to those who have favored its pages with their assistance; since the authors have, in most cases, on suggestion, permitted their writings to be authenticated by the insertion of their names, as should always be the case in matters of fact, observation, and research. One illustrious name however must not be passed over without a tribute of gratitude for its valued and frequent contributions, a tribute more sincerely paid, since India has now lost the power and the claim to their continuance; she has resigned her most eminent oriental scholar to climes where his talents may find more genial appreciation, but where they cannot excite more respect or admiration, than they will ever command in the land which called forth their energies and directed their application.

The learned Societies at home will be proud to publish the continuation of the *Analyses of the Purânas*, of which the four first have appeared in these pages. Abstracts of four only were ready for the press, but translations of the remainder of the eighteen *Purânas* themselves had been completed under the superintendence of Professor Wilson, before he quitted India.

Mr. Alexander Csoma's indefatigable labour, in opening to us a first acquaintance with the literature of Tibet, will be estimated as it deserves by literary men—a contracted circle perhaps, because deep erudition and study are requisite to form critics capable of appreciating the nature and bearing of his peculiar researches upon the history, languages, and religions of other nations, both ancient and modern. All may however feel sensible of the devotion, zeal, and perseverance, which are necessary to lead a man, alone and unpaid, into a distant and wild country, to learn its language, and study its people at the fountain head. The volumes of notes which Mr. Csoma has presented to the Asiatic Society, will, it is hoped, be published in their Researches at length.

In furtherance of the desire of the Government, the greater part of Dr. Buchanan's Statistics of Dinajpúr has been printed in a detached form, as commenced by the Editor of the GLEANINGS; and to complete the work more speedily, two extra numbers have been issued in the course of the year. It will be remarked, that there are many plates referred to in the text: the drawings alluded to are in possession of the Honorable Court of Directors, along with the original manuscripts; it was thought better to preserve the references, in case the Hon'ble Court might hereafter be persuaded to publish them, either in a separate form, or of a size adapted to the present edition. It must not be forgotten, that it is this undertaking which gained to the GLEANINGS the valuable privilege of free postage through the Bengal Presidency. The Editor is happy to announce, that the same boon has, in the most liberal manner, and without any solicitation, been extended to the Presidency of Bombay and to the Government of Ceylon, by their enlightened Governors, His Excellency the Earl of CLARE, and the Right Honorable Sir R. W. HORTON, to whom his thanks are thus publicly and respectfully addressed.

To his numerous correspondents, the Editor can but proffer thanks for past, and solicitations for future, support, bidding them remember that, the scope and object of this publication embraces the literature, the manners, the geography, physical and mineral, the arts, the natural productions of Asia, the phenomena of its climate, and observations of the heavens. In the words of the illustrious founder of the Asiatic Society, " the bounds of its investigation will be the geographical limits of Asia; and within these limits its inquiries will be extended to whatever is performed by man or produced by nature."

Dedicated, by permission, to

LADY W. C. BENTINCK,

A

TREATISE

ON

THE MUSIC OF HINDOOSTAN,

COMPRISING A DETAIL OF

THE ANCIENT THEORY

AND

MODERN PRACTICE.

THE similarity of the music of Egypt and Greece to that of this country has been traced and pointed out: harmony and melody have been compared: and time noticed. The varieties of song have been enumerated, and the character of each detailed: a brief account of the principal Musicians superadded, and the work concluded with a short alphabetical glossary of the most useful musical *Terms*.

BY

CAPTAIN N. WILLARD,

Commanding in the Service of H. H. the Nuwab of Banda.

Price to Subscribers, Sa. Rs. 8.

PROSPECTUS.

A TREATISE on the Music of Hindoostan was much wanted. The scanty information obtainable through the channels of Dr. GILCHRIST and Sir WILLIAM JONES, are neither of themselves sufficient to fill this chasm, nor do they elicit light sufficient to enable one to grope through the various obscure writings in the vernacular languages and dialects. The songs set to music by Mr. BIRD and Mr. WALKIER, are of the more modern style, and not of the ancient school; so that, instead of elucidating the theory, they lead us into confusion, when compared with the tables of Rags and Raginees given by Sir W. JONES.

The forthcoming work has been written with the view of describing in some measure, the theory and practice of the original music of Hindoostan, but chiefly to unfold the beauties of which it is susceptible. The extravagant eulogium offered to the music of ancient Greece, and the striking similarity which appeared to the author to exist between that and the subject to be treated of in this work, has led him to point them out, in the hope that, should a taste for the music of this country obtain among the professors of the science in Europe, it might perhaps conduce to the elucidation and revival of a much-desired and lost branch of knowledge, namely, the music of ancient Egypt and Greece.

For this purpose it appeared to the author, that a bare translation of any of the existing native works would not suffice. All who have been taught music are so much accustomed to the European way of explaining it, that every other must necessarily appear uncouth and preposterous. In the arrangement of this work, therefore, the European system has been adopted.

CONTENTS.

N. B. *The work will be printed on superior English paper, at the Baptist Mission Press, Calcutta.*

Subscriptions will be received by Mr. A. Jewell, Moorghehuttah, and Messrs. Thacker and Co. St. Andrew's Library.

CONTENTS.

No. 1.—JANUARY.

No. 2.—FEBRUARY.

No. 3.—MARCH.

No. 4.—APRIL.

No. 5.—MAY.

DIRECTIONS TO THE BINDER.

The sheets of Buchanan's Statistics are to be separated from the monthly numbers. The Plates may either be bound up at the end of the volume, or in the following order :

ERRATA.

Page 10 line 9 *for* "wool," *read* "wood."
—— 11 — 7 *from bottom, for* "plate 1, fig. 2," *read* "plate 2, fig. 1."
—— 14 *last line, for* "delomite," *read* "dolomite."
—— 19 — 16 *from bottom, for* "3, 4, 5," *read* "1, 2, 3, 4."
—— 20 — 8 *from top, for* "plate 1," *read* "plate 2."
—— 20 — 9 *for* "he protracted," *read* "the protracted."
—— — — 11 *for* "BB″ B′," *read* "B″ B′."
—— — — 16 *for* "intercepts," *rsad* "intersects."

AND

In Fig 2, *plate II.* continue the dotted arc 1′1 a'' to a'.
The line A c' continue to c.

—— 28 — 7 *from top, for* "manima," *read* "minima."
—— — *at bottom, for* "Artesien," *read* "Artesian."
—— 33 — 7 *for* "January," *read* "February."
—— 410 — — *in last column* of Table II. *for* "2m. 58s. 8," *read* "0m. 58s. 8."
—— 46 — 18 *from top, after* "which" *insert* "comma."
—— — — — ——————— "either" ditto.
—— 47 — 2 *from top, for* "have," *read* "has."
—— 57 — 12 *for* "$99\frac{1}{4}$ $99\frac{1}{2}$ $99\frac{3}{4}$," *read* "99^{1} 99^{2} 99^{3}."
—— 59 — 24 *and throughout the article, for* "sack," *read* "sac."
—— 60 — 4 "orbitar," *read* "orbital."
—— — — 10 "interval," *read* "internal."
—— — — 29 "lips," *read* "tips."
—— — — 34 *dele* "by."
—— 60 — 15 *for* "compressed and hard; before," *read* "compressed and hard before ;"
—— — — 28 *for* "lips," *read* "tips."
—— 62 — 11 *for* "this Chiru," *read* "the Chiru."
—— 63 — 10 *for* "bambdoidal," *read* "lambdoidal."
—— — — 14 *for* "malars," *read* "molars."
—— 65 — 8 *for* "$1\frac{1}{8}$," *read* "$\frac{3}{1\,6}$."
—— 67 — 2 *from bottom, after* "than," *read* "the."
—— 74 — 15 *for* "9°," *read* "9^{h}."
—— 75 — 21 *dele* "rufous," repeated.
—— 79 — 17 *from bottom, for* "done," *read* "donc."
—— 148 — — *foot note, for* "Rutboo," *read* "Kubboo."
—— 226 1st par. 5th line *for* "Ekadantashtra," *read* "Ekadanshtra,"
—— 226 4th „ 4th — *for* "Kridama," *read* "Srid'ama"
—— 229 2nd „ 5th — *for* "Vrishapati," *read* "Vrihaspati."
—— 231 — „ 3rd — *for* "Viswaséna" *read* "Viswakerma."
—— 238 — „ *after* "Ganges river," *insert* "at Gházipur."
—— 245 10 „ *from bottom, for* "it," *read* "the mirror."
—— — 1st „ 7th — *for* "He having," *read* "Having."
—— 296 line 3 *for* "but mostly," *read* "and,—"
—— — — 7 *for* "hydrogen. When," *read* "hydrogen, where."
—— 305 — 20 *for* "circumference," *read* "diameter."
—— — — 21 *for* "27$\frac{1}{4}$ rupees," *read* "2$\frac{1}{2}$ rupees."

Errata in Meteorological Register, for June.

Date	Hour.		Bar.		
13	Sun-rise,	*for*	,365	*read*	,465
14	„		,399		,499
22	„		,517		,617

Add 0,010 to all the figures in the Barometrical column for 10½ P. M.

—— 340 — 6 *after* "*Rhinolphus,*" *insert* "and two species of *Vespertilio.*"
—— 355 — 13 *for* "ακανσα," *read* "ακανστα."
—— 355 — 2 *from bottom, after* "*nílam,*" *insert* "*níl mani,* (or *manik.*)"
—— 356 *after* "College of Fort William," *insert* "the word *bahrmani* is also used in the *Khawás-ul* [illegible]*ir,* as a variety of the *yaqút.*"
—— 358 — 20 *dele* "or a species of garnet."
—— 358 — 22 *for* "*manik,*" *read lálri.*"
—— 403 — 5 *from bottom, for* "ΔΙΟΚΛΠ," *read* "ΔΙΟΚΛΗ."
—— 404 — 14 *for* OVA," *read* "OTA."
—— 411 — 8 *for* "Latitude 25° 43′," *read* "Lat. 25° 47′ 26″."

In Table IV. of the Estimate of Life in India, page 284, the first four figures in the second and third column should stand thus:

Age.	Survivors.	Deaths.
20	52221	473
21	51748	489
22	51259	522
23	50737	557

The mistake arose from the calculations having originally been made to commence with the age of nineteen, instead of twenty: and the 5 year averages in Table III. page 283, will all be slightly affected by the same cause. The last figure in the second column, page 284, should be reversed; and in the last column but one, *for* "2080," *read* "2008."

Line 414 line 3 *from below, for* "molluscæ," *read* "mollusca."
—— 444 — 36 *after* "ministry," *insert* "of a man."
—— 445 — 3 *from below, for* "2125," *read* "212.5."
—— 446 — 7 *for* "in bullion," *read* "bullion."
—— 447 — 21 *for* "will be," *read* "would be."
—— — — — *after* "at any," *insert* "rate."
—— 480 — 15-16 *for* "Tarîqa-i-Chishíta," *read* "Tarîqa-i-Chishtía."
—— 483 — 36 *for* "lost about," *read* "tost about."
—— — — 39 *for* "Mújtahid-i-mústuqill," *read* "Mújtahid-i-mústaqill."
—— 485 — 20 *for* "Taqwiat-ul-Imám," *read* Taqwiat-ul-Imán."
—— 487 — 15 *erase* "5" at begiuning of line.
—— 488 — 7 *for* "differences," *read* "difference."
—— 489 — 20 *for* "Káfr," *read* "Kufr."
—— 491 — 23-24 *for* Ishrák f'il Tasarraf," *read* "Ishrák f'il Tasarruf."
—— 492 — 10-11 *for* "the authority or influence of Saints, as respecting intercessors," *read* "respecting the authority or influence of Saints as intercessors."
—— 498 — 23 *for* "Khátim," *read* "Khátima."
—— 501 — 12 *after* "A B C," *insert* "[fig. 5.]"
—— 505 — 20 *for* "5 53 59," *read* "5 52 59."
—— 506 — 11 *for* "5 53 10," *read* "5 53 27."

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 1.—*January*, 1832.

I.—*Abstract of the Contents of the Dul-vá, or first Portion of the Káh-gyur, from the Analysis of Mr. Alexander Csoma de Körös. By* H. H. Wilson, *Sec. A. S.*

[Read 9th November.]

At the last Meeting of the Asiatic Society, a general view of the contents of the two great Thibetan works, the *Káh-gyur* and *Stán-gyur*, and especially of the former, was submitted, founded on materials supplied by Mr. Csoma de Körös. It was also stated, that that gentleman had consented to prepare a more detailed analysis of the whole from the copy in the Society's possession; and he has accordingly furnished the Society on the present occasion, with the result of his subsequent labours, being an analytical sketch of the contents of the *Dul-vá*, or first great division of the *Káh-gyur*.

It was stated in the preceding sketch, that the *Káh-gyur* usually consisted of 100 large volumes, classed under seven great divisions; each comprising a greater or lesser number of volumes, treating of the religious practices and tenets of the Baud'dhas; written originally in Sanscrit, but translated into Tibetan, for the greater part in the ninth century.

Of those divisions, it was also mentioned, that the first, or *Dul-vá*, termed in Sanscrit *Vinaya*, Decorum or Discipline, occupied 13 volumes; and as introductory to the whole, described the different observances to be followed by the votaries of Bud'dhism, but more especially by those, whether male or female, who adopted a religious life. These observances are of a very comprehensive description, extending not only to moral and ceremonial duties, but to modes of personal deportment, and the different articles of food or attire. The precepts are interpersed with legendary accounts, explaining the occasion on which Sa'kya thought it necessary to communicate the instructions given.

The *Dul-vá*, according to the analysis now submitted, comprises seven portions.

1. *Tib.* Dul-va-zhi; *Sans.* Vinaya-vastu. The substance or basis of discipline, 4 vols.

2. *Tib.* So-sor-t'har-pé-do; *Sans.* Pratimoksha Sútra. Rules for emancipation, 30 leaves.

3. *Tib.* Dul-vá-nám-pár-jet-pá; *Sans.* Vinaya-vibhanga. Neglect of discipline or transgression, 4 vols.

4. *Tib.* Gé-long-má-so-sor-thár-pé-do; *Sans.* Bhikshuni-pratimoksha Sútra. Rules for emancipation for nuns, or female mendicants.

5. *Tib.* Gé-long-má-dul-vá-nám-pár-jet-pá; *Sans.* Bhikshuni-vinaya-vibhanga. Neglect of discipline by female mendicants, in one volume, with the preceding tract.

6. *Tib.* Dul-vá-phrán-tshegs-kyi-zhi; *Sans.* Vinaya-kshudraka-vastu. Minor essentials of discipline, 2 vols.

7. *Tib.* Dul-vá-zhung-la-má; *Sans.* Vinaya Uttarâ-grantha. The last treatise on discipline, 2 vols.

Some admit only four divisions of the Dul-vá, termed in Sanscrit :— 1. Vinaya-vastu. 2. Pratimoksha Sútra and Vinaya-vibhanga. 3. Vinaya-kshudraka-vastu; and 4. Vinaya Uttara-grantha.

The first part of the Vinaya-vastu treats of the *Pravrajita-vastu*, the circumstances under which the religious profession may be adopted.

It opens with an account of the hostilities that usually prevailed between the kings of *Anga*, the country about Bhagalpur, and the kings of *Magadha*, or Behar, until PADMA-CHENPO, sovereign of the latter, became tributary to his rival, an event that happened shortly before SA'KYA's appearance on earth.

Before the same occurrence also, the birth and education of VIMBASA'RA, surnamed SRENI'KA, the son of PADMA-CHENPO, are described. The young prince encourages his father to withhold the tribute, and in the war that ensues, defeats, and kills the sovereign of *Anga*, and annexes that country to his patrimonial government. He subsequently succeeds his father and is ruling at his capital *Rajagriha*, at the time of SA'KYA's birth.

The particulars of SA'KYA's birth are not enumerated in this place; but an account is given of his two first disciples SARIPUTRA and MANGALAYANA, two young philosophical Brahmans, who have studied under different masters, without being satisfied with any of their instructors; the particulars of whose tenets are enumerated. At last they find SA'KYA teaching in *Rajagriha*, and attach themselves to his person.

The doctrine of Sa'kya finds a patron in Vimbasa'ra, and he is described as residing some time in *Rajagriha*, enjoying great fame as a teacher and master of numerous converts; his mode of teaching is also exemplified, and various philosophical controversies between him and the advocates of other systems are detailed.

The mode in which his converts are received into the order of the priesthood, either by himself or by his disciples, is then particularized. Two presidents are appointed, and five classes of teachers ordained. Questions to be propounded are given, and the description of persons inadmissible from bodily imperfections or disease described. A variety of rules on the subject of admission is laid down.

The behaviour of the person after admission is then regulated; the cases in which he should require the permission of his principal specified; and various moral obligations prescribed, particularly resignation and forbearance, when maltreated or reviled.

Stories are related of improprieties committed by some juvenile members of the community, and in consequence Sa'kya desires that none shall be admitted under 15, and no priest be ordained under 20 years of age. Other stories give rise to other limitations, prohibiting the admission of slaves, debtors, runaways, hermaphrodites, diseased or maimed persons, young men without the consent of their parents, and persons who have families dependant upon them. No person is to be admitted, except in full conclave—nor any one to be allowed to reside amongst the priests without ordination—no thieves, parricides, matricides, nor murderers are to be admitted. Each of these prohibitions arises out of some incident occurring in the course of Sa'kya's peregrinations between *Magadha*, *Kosalá* or Oude, *Srávastí*, and *Kapila*.

The next subject is the performance of confession and expiation, which should be observed every new and full moon, in a public place, and congregation: the manner of conducting the ceremony is fully detailed.

The rest of the first volume is occupied with a number of precepts and prohibitions, some of them of a whimsical character: such as that a priest shall not wear wooden shoes, nor lay hold of a cow's tail to assist himself in crossing a river.

The second volume continues the subject of dress, especially on the fitness of leather or hides for the shoes of the priests; a treatise on drugs and medicaments then follows, which the disciples of Sa'kya are allowed to use or to carry about them.

The king of *Magadha* entertains Sa'kya for three months, and various legends are told.

In the course of them, the six chief cities of India are said to be *Srávastí*, *Sáketana*, *Váránasí*, *Vaisálí*, *Champá* and *Rajagriha*.

The two first are in Oude, *Varánasí* is Benares, *Vaisálí* is considered to be Allahabad, *Champa* is Bhagalpúr, and *Rajagriha*, or *Rajgiri* is in Behar.

From *Magadha*, SA'KYA goes to *Vaisáli* upon the invitation of the *Lichchivi* inhabitants of that city, who appear to have been republicans, and to have possessed great riches.

The peregrinations of SA'KYA are continued throughout the volume, in which he encounters and converts many individuals, whose stories are told, not only during the present, but their past lives. Amongst others, SA'KYA relates his own, and how he became a Bodhisatwa, or sage. The conclusion of the volume leaves him at the lake *Manasarovara*, with 36 of his principal disciples.

The third volume continues in the same strain. At a place in *Kosala*, SA'KYA and his followers are entertained by way of test, and are found to be moderate and easily contented. The Brahmans are tried by a similar test, and proved to be greedy and insatiable.

Similar lessons, as in the preceding volumes, are given to the priests. They are permitted to eat treacle—to cook for themselves in time of famine, and to cook in ten places—to eat meat under certain restrictions—to accept gifts from the laity. The stories and lectures are interspersed with notices of medicines and the mode of administering them, and the medical employment of charms and incantations.

The subject of the succeeding pages is the proper attire to be worn by the disciples of SA'KYA; they are directed to wear not more than three pieces of cloth, of a red colour—to wear cotton garments when bathing—to be clean in their dress and in their bedding—and never to go naked. An injunction at variance with some notions of Bud'dhism, the images of the saints of which have been supposed to be represented without clothes, and furnishing a distinguishing characteristic between them and the images of the Digambara Jains.

The subject of dress is followed by that of the use of mats or sheets to lie upon.

A more important division then succeeds, on the conduct to be observed towards refractory and disputatious brethren. They are first to be admonished in public congregation, and if impenitent, to be expelled from the community. The mode in which confession, repentance, and absolution are observed is next explained, and illustrated by examples.

The residences and furniture of the monks are next described, and the next subject is said to be dissensions in religious communities. Little on this head, however, is given, and the rest of the volume is

occupied with miscellaneous matter. One subject is an account given of the origin of the Sa'kya race by Mangalayana, at the desire of Sa'kya, to the people of *Kapila-vastu;* and another the birth and education of Sa'kya himself.

Vol. 4 continues the story of Sa'kya, especially the circumstances that led to his entering upon the life of an ascetic, and his subsequent proceedings. In this book the *Sákyas* are called inhabitants of *Kosalá*, a country bordering on the *Kailas* mountains, and descendants of the Hindú king Ikshwaku. The birthplace of Sa'kya is said to be *Kapila-vastu*, near the Himalaya, on the banks of the Bhagirathí. The latter pages illustrate what is considered to be the subject of the whole book, the evils of causing schisms, by instances of the inveterate hostility of L'has-kyim, the nephew of Sa'kya, towards his uncle.

The fifth volume commences with the *Pratimoksha Sútra*, short precepts for the securing of final felicity; the sum of which is, that vice is to be diligently avoided, virtue invariably practised, and the passions be kept under entire subjugation.

Then follows, and extends through the rest of this volume and the three next, a code of laws for the monks, comprehending 253 rules. Each of these arises in general from some improper conduct in a religious person, which forms a separate incident or tale. The matter comes to Sa'kya's knowledge, who sends for the culprit into the congregation, where he is duly lectured. On his confession and penitence, he is pardoned, and Sa'kya enacts the rule or law preventive of a like transgression.

The ninth volume is of the same general character as the preceding four; but it is addressed to the female followers of Bud'dha, priestesses or nuns, *Gélong-má*, or *Bhikshuní:* many of the rules and illustrations are repeated from the foregoing volumes, and in the same terms.

The tenth and eleventh volumes relate to matters and rules of minor importance, such as that the monks shall not use vitrified brick as a flesh-brush, nor fragrant unguents, nor rings, nor seal rings of the precious metals, nor eat garlic, nor learn music or dancing. There are also directions for the construction of *Chaityas,* and the deposit therein of reliques, as the hair, nails, &c. of Bud'dha, given by him to various persons during his life. There are also some tales of a political or historical character, especially the destruction of *Kapila* by the king of *Kosala*, and the murder or expulsion of the *Sákyas*, many of whom are said to have fled to Nepal. The eleventh volume closes with an account of the *Nirván*, or emancipation of Sa'kya in *Kamrúp*, or Western Asam. Eight cities contend for his remains, which are divided amongst them, and deposited in *chaityas* or mausolea.

On the death of SA'KYA, KASYAPA, the head of the Bauddhas, directs 500 superior monks to make a compilation of the doctrines of their master. The *Do* is also compiled by ANANDA; the *Dul-vá* by UPALI; and the *Ma-moon*, *Abhidharma*, or *Prájná-páramita* by himself. He presides over the sect at *Rajagriha* till his death.

ANANDA succeeds as hierarch. On his death his reliques are divided between the *Lichchivis* and the king of *Magadha*; and two *chaityas* are built for their reception, one at Allahabad, the other at Pataliputra.

One hundred years after the disappearance of SA'KYA, his religion is carried into Kashmir.

One hundred and ten years after the same event, in the reign of ASOKA, king of *Pataliputra*, a new compilation of the laws of SA'KYA was prepared by 700 monks, at *Yangs-pa-chen*, (Allahabad.)

The twelfth and thirteenth volumes contain supplementary rules and instructions, as communicated by SA'KYA to UPALI, his disciple, in answer to the enquiries of the latter.

We shall be better prepared upon the completion of the catalogue of the whole of the *Káh-gyur* to offer any remarks upon the doctrines it inculcates, or the historical facts it may be supposed to preserve. It is therefore rather premature to make any observations upon the present analysis, confined as that is to but one division of the work, and unaccompanied by extract or translation; but we may perhaps be permitted to enquire what new light it imparts, as far as it extends, to the date and birthplace of SA'KYA.

Any thing like real chronology is, if possible, more unknown in Baud'dha than Brahmanical writings; and it is in vain therefore to expect any satisfactory specification of the date at which the *Bud'dha* SA'KYA flourished. We find however that 110 years after his death, ASOKA king of *Pataliputra* reigned: now in the *Vishna Purana* and one or two other Puranas, the second king of *Magadha* from *Chandragupta*, or *Sandrocoptos*, bears the title of ASOKA, or ASOKAVERDDHANA. If this be the prince intended, SA'KYA lived about 430 years before the Christian æra, which is about one century posterior to the date usually assigned for his appearance. It is not very different, however, from that stated by the Siamese, to Mr. Crawfurd. "By their account, his death took place in the first year of the sacred æra, being the year of the little snake; on Tuesday, being the full moon of the sixth month of the year. The year 1822 was the year 2364 of the æra in question, and as Bud'dha is stated by them to have died when 80 years of age, his birth by this account took place 462 years before the Christian æra." *Crawfurd's Siam*, 367.

A discrepancy apparently of a more decided character occurs as to the place of Sa'kya's nativity. This has been hitherto considered to have been *Kíkata* or *Magadha*, the modern province of Behar, the latter being evidently intended by that country in *Jambu Dwip*, or India, which is called *Makata* by the Burmese and the Siamese, *Mo-ki-to* by the Chinese, and *Makata Kokf* by the Japanese, according to several European writers of authority.

Now according to the *Káh-gyur* the birth place of Sa'kya is not in *Magadha*, but in *Kosala*, or Oude, at a city called *Kapila* or *Kapila-vastu*, and this latter term explains the nature of the mistake. The Chinese specify *Kau-pi-le*, the Burmese *Ka-pi-la-vot*, the Siamese *Ka-bi-la-pat*, the Cingalese *Kimboul-pat*, and the Nipalese *Kapila-pur*, as the city in which their legislator was born—considering, therefore, *Makata* to be the principality or province in which it was situated. For some centuries before Christ, and about the probable period of Sa'kya's nativity, the greater part of central India was subject to *Magadha;* and it is not extraordinary therefore that *Kosala*, in which *Kapila* is situated, was considered as a subordinary, and may have been a tributary or dependant principality, and so far therefore *Kapila* was in the kingdom, though not the country of *Magadha.* At any rate, that *Magadha* was the first and principal scene of Sa'kya's labours is universally admitted. Minutely accurate topography, and history, are not to be expected in these cases; and it is not wonderful that the followers of Bud'dha, who derived their traditions from sources of a less authentic description than those of Tibet, should have placed *Kapila* in Behar, or elevated its chief, a petty Raja, to be king of central India. The latter mistake is committed by the Mongols, who as neighbours of the Tibetans, should have known better; yet even they call Soduduni, the father of Sa'kya, king of *Magadha*, Der Königvon Magadha. (Klaproth, Asia Polyglotta 123.)

The precise situation of *Kapila*, it is not now easy to ascertain. The Tibetan writers place it near *Kailas*, on the river *Bhagirathi*, or as elsewhere stated, on the *Rohini* river. These indications, connected with its dependency on *Kosala*, render it likely that it was in Rohilkund, or in Kamaon, or perhaps even rather more to the eastward; for the river now known as the *Rohini* is one of the feeders of the *Gunduk*—at any rate it must have been on the borders of Nepal; as it is stated that when the *Sákyas* were dispossessd of their city, those who escaped retired into that country.

Another question is, who were the *Sákyas?* The Baud'dha traditions trace them from Ikshwaku, a prince of the solar line, and ancestor of the race that reigned in *Ayodhya* or Oude. The name however does

not occur in the Hindu genealogical lists, either as that of a tribe or people. It is most akin to the term *Sakas*, the *Sacæ* or Scythians of antiquity, the Tartars of modern times; and it is not at all unlikely that a colony of these people settled in this part of India, as did the Afghans many centuries later in Rohilkund. In that case they probably brought with them the faith of Bud'dha, and communicated it to India, whence it returned to them improved by the scholarship of learned converts. It is very doubtful, if Bud'dhism ever prevailed extensively in central Hindustan, whilst it is quite certain, that it flourished exceedingly in the north and west of India, about the commencement of the Christian æra. We know that it is still widely cultivated throughout central Asia, and that part of the world is most probably its ancient and original seat. Some additional light may possibly be thrown on these subjects by the succeeding portions of the *Káh-gyur*.

II.—*On the Native Method of making the Paper, denominated in Hindustan, Nipalese. By* B. H. Hodgson, Esq. *Acting Resident, Nepal.*

FOR the manufacture of the Nipalese paper the following implements are necessary, but a very rude construction of them suffices for the end in view.

1*st.* A stone mortar, of shallow and wide cavity, or a large block of stone, slightly but smoothly excavated.

2*nd.* A mallet or pestle of hard wood, such as oak, and in size proportioned to the mortar, and to the quantity of boiled rind of the paper plant which it is desired to pound into pulp.

3*rd.* A basket of close wicker work, to put the ashes in, and through which water will pass only drop by drop.

4*th.* An earthen vessel or receiver, to receive the juice of the ashes after they have been watered.

5*th.* A metallic open-mouthed pot, to boil the rind of the plant in. It may be of iron, or copper, or brass, indifferently ; an earthen one would hardly bear the requisite degree of fire.

6*th.* A sieve, the reticulation of the bottom of which is wide and open, so as to let all the pulp pass through it, save only the lumpy parts of it.

7*th.* A frame, with stout wooden sides, so that it will float well in water, and with a bottom of cloth, only so porous that the meshes of it will stay all the pulp, even when dilated and diffused in water ; but

will let the water pass off, when the frame is raised out of the cistern; the operator must also have the command of a cistern of clear water, plenty of fire-wood, ashes of oak, (though I fancy other ashes might answer as well,) a fire place, however rude, and lastly, quant. sufficit of slips of the inner bark of the paper tree, such as is peeled off the plant by the paper makers, who commonly use the peelings when *fresh* from the plant; but that is not indispensable. With these "appliances and means to boot," suppose you take four seers of ashes of oak, put them into the basket above-mentioned, place the earthen receiver or vessel beneath the basket, and then gradually pour five seers of clear water upon the ashes, and let the water drip slowly through the ashes and fall into the receiver. This juice of ashes must be strong, of a dark bark-like red colour, and in quantity about 2lbs.; and if the first filtering yield not such a produce, pass the juice through the ashes a second time. Next, pour this extract of ashes into the metal pot, already described, and boil the extract; and so soon as it begins to boil, throw into it as many slips or peelings of the inner bark of the paper plant as you can easily grasp, each slip being about a cubit long, and an inch wide; (in fact the quantity of the slips of bark should be to the quantity of juice of ashes, such that the former shall float freely in the latter, and that the juice shall not be absorbed and evaporated with less than half an hour's boiling.) Boil the slips for about half an hour, at the expiration of which time, the juice will be nearly absorbed, and the slips quite soft. Then take the softened slips and put them into the stone mortar, and beat them with the oaken mallet, till they are reduced to a homogeneous or uniform pulp, like so much dough. Take this pulp, put it into any wide-mouthed vessel, add a little pure water to it, and churn it with a wooden instrument like a chocolate mill for ten minutes, or until it loses all stringiness, and will spread itself out when shaken about under water. Next, take as much of this prepared pulp as will cover your paper frame, (with a thicker or thinner coat according to the strength of the paper you need,) toss it into such a sieve as I have described, and lay the sieve upon the paper frame, and let both sieve and frame float in the cistern: agitate them, and the pulp will spread itself over the sieve; the grosser and knotty parts of the pulp will remain in the sieve, but all the rest of it will ooze through into the frame. Then put away the sieve, and taking the frame in your left hand, as it floats on the water, shake the water and pulp smartly with your right hand, and the pulp will readily diffuse itself in an uniform manner over the bottom of the frame. When it is thus properly diffused, raise the frame out of the water, easing off the water in such a manner that the

uniformity of the pulp spread, shall continue after the frame is clear of the water, *and the paper is made.*

To dry it, the frame is set endwise, near a large fire; and so soon as it is dry, the sheet is peeled off the bottom of the frame and folded up. When (which is seldom the case) it is deemed needful to smooth and polish the surface of the paper, the dry sheets are laid on wooden boards and rubbed, with the convex entire side of the conch-shell; or, in case of the sheets of paper being large, with the flat surface of a large rubber of hard smooth-grained wool; no sort of size is ever needed or applied, to prevent the ink from running. It would probably surprise the paper-makers of England, to hear that the *Kachár* Bhoteahs can make up this paper into fine smooth sheets of *several yards square.* This paper may be purchased at Katmandu in almost any quantity, at the price of 17 annas sicca per *dharni* of three seers: and the bricks of dried pulp may be had* at the same place, for from 8 to 10 annas sicca per *dharni.* Though called Nipalese, the paper is not in fact made in Nepal proper. It is manufactured exclusively in Cis-Himalayan Bhote, and by the race of Bhoteahs denominated (in their own tongue) *Rangbo*, in contradistinction to the Trans-Himalayan Bhoteahs, whose vernacular name is *Sokhpo*†. The *Rangbo* or Cis-Himalayan Bhoteeahs are divided into several tribes, (such as *Múrmi*, *Lapcha*, &c. &c.) who do not generally intermarry, and who speak dialects of the Bhote or Tibet language so diverse, that, ignorant as they are, several of them cannot effectually communicate together. They are all somewhat ruder, darker, and smaller, than the *Sokhpos* or Trans-Himalayan Bhoteeahs, by whom they are all alike held in slight esteem, though most evidently *essentially* one and the same with themselves in race and in language, as well as in religion.

To return to our paper-making,—most of the Cis-Himalayan Bhoteahs, east of the Kali river, make the Nipalese paper; but the greatest part of it is manufactured in the tract above Nepal proper, and the best market for it is afforded by the Nipalese people, and hence probably it derived its name; a great quantity is annually made

* The pulp is dried and made up into the shape of bricks or tiles, for the convenience of transport. In this form it is admirably adapted for transmission to England. See the P. S.

† The Newar language has terms precisely equivalent to these; the Rangbo being called, in Newary, Paloo Sén; and the Sokhpo, Thá-Sén. The Sokhpo here spoken of is not really a different word from Soghpúr-nomade, the name *ordinarily* applied in Bhote to the Mongols. But this word has at least a different sense in the mouths of the Tibetans towards *this* frontier, on both sides of the Snows.

and exported southwards, to Nepal and Hindústan, and northwards, to *Sakya-Gúmba*, *Digarchí*, and other places in Tramontane Bhote. The manufactories are mere sheds, established in the midst of the immense forest of Cis-Himalayan Bhote, which afford to the paper-makers an inexhaustible supply, on the very spot, of the firewood and ashes, which they consume so largely: abundance of clear water (another requisite) is likewise procurable every where in the same region. I cannot learn by whom or when the valuable properties of the paper plant were discovered; but the Nipalese say that any of their books now existent, which is made of Palmira leaves, may be safely pronounced, on that account, to be 500 years old: whence we may perhaps infer that the paper manufacture was founded about that time. I conjecture that the art of paper making was got by the Cis-Himalayan Bhoteahs, viâ Shassa, from China. A paper of the very same sort being manufactured at Shassa; and most of the useful arts of these regions having flowed upon them, through Tibet, from China; and not from Hindústan.

Nepal Residency, *Nov.* 1831.

P. S.—Dr. Wallich having fully described the paper *plant*, it would be superfluous to say a word about it. The *raw produce* or pulp (beat up into bricks) has been sent to England, and declared by the ablest persons to be of unrivalled excellence, as a material for the manufacture of that sort of paper upon which proof-engravings are taken off. The *manufactured* produce of *Nepal* is for office records incomparably better than any Indian paper, being as strong and durable as leather almost, and quite smooth enough to write on. It has been adopted in one or two offices in the plains, and ought to be generally substituted for the flimsy friable material to which we commit all our records.

III.—*Account of a new Genus of Land Snails, allied to the Genus Cyclostoma, of Lamarck; with a Description of a Species found on the outlying Rocks of the Rájmahal range of Hills.* *By* W. H. Benson, Esq. *Bengal Civil Service.*

[Plate I. fig. II. *a. b. c.*]

Genus PTEROCYCLOS. Testa discoidea, suprà convexiuscula, subtùs concava, late umbilicata; anfractibus cylindraceis, vix cohærentibus, omnibus utrinque apparentibus; suturis excavatis; peristomate reflexo, supernè sinu obliquo interrupto; labro suprà alâ fornicatâ sinum obtegente instructo; alâ latâ, tumidâ, anticè declivi, mucronatâ, anfractui penultimo adhærente.

Animal adhuc incognitum, forsàn Cyclostomati simile.

Habitat in rupibus umbrosis Patharghatæ et Sikrigali.

Shell discoid, somewhat convex above, concave below, and widely umbilicated; whorls cylindrical, slightly adhering together, and visible on both sides. Sutures channelled. Peristome reflected, interrupted at the summit of the aperture by an oblique sinus. Outer lip furnished at the upper part, with an arched wing, which overhangs the sinus. Wing broad, tumid, bending downwards, and mucronate in front, adhering to the penultimate whorl.

This new form I discovered on the 15th and 16th December, 1831, among the jungle-covered rocks of the hill of Patharghâta, one of the western outliers of the Rájmahal range, situated a little below Kalgaon, on the Ganges; and on the eminence of Sikrigali, another outlier of the same range to the north-east. The specimens were met with under the perpendicular and overhanging faces of low rocks, and under accumulations of dead leaves. All those found were unfortunately destitute of inhabitants, a circumstance the more to be regretted, as the conformation of the upper part of the peristome and the presence of a wing, (a character hitherto unknown to belong to land shells, as far as my information on the subject extends,) argue a corresponding variation in the animal from any known type. The sinus probably affords a passage to some process of the mantle, which the wing is intended to defend from injury.

The genus which most nearly approaches to Pterocyclos is Cyclostoma, which is furnished with a circular aperture and a continuous peristome; but the characters above referred to will necessarily exclude this shell from it. Lamarck's species C. planorbula, which varies much from his other species, and which is also widely umbilicated, appears to have the greatest affinity to the shell before me; and it has a still closer affinity to it than would be supposed from Lamarck's description, if Wood's figure of Helix cornu-venatorium is to be relied on, for the latter shell has a sinus (not alluded to by Lamarck) at the top of the aperture; but it shews no trace of the overhanging wing. Lamarck gives Helix cornu-venatorium of Gmelin as a synonyme of his C. planorbula, but with a mark of doubt, and refers to a figure in Chemnitz, to which Wood also refers for his Helix cornu-venatorium. It is probable, that that species will be found to be osculant between the genera of Cyclostoma and Pterocyclos.

If it had been my good fortune to have procured any of the Pterocycli alive, I should have had a good opportunity of comparing the characters of the animal with those of Cyclostoma; having found several fine specimens of a new species of the latter genus, with the live

animals, at Sikrigali and at Rajmahal. It is highly probable, that Pterocyclos will be found on the neighbouring outlying rocks of Pírpointí, on the ridge between Patharghíta and Kàsita, on the isolated hill in the neighbourhood of an Indigo-planter's house, between Kásita and Kalgaon; and on a similar hill, at the back of the latter place, as well as on any part of the neighbouring main range of Rajmahal. It would be worth a conchologist's while, who may have an opportunity of visiting these rocks in showery weather, or shortly after a fall of rain, to seek for specimens of the shell for the purpose of inspecting the animal. I regretted that I had no time to spare for a careful search at either of the places cited as localities of the species. Those which I found, were, with several specimens of a Cyclostoma, a reversed Carocolla and Macrochlamys*, collected in the space of a few minutes, and in a hurried search. The best method of collecting is to take several servants up the rocks, and after shewing them what objects are required, to employ them in turning over the fallen leaves, and in inspecting the loose rubbish in the crevices of rocks.

The species, which appears to be confined to rocky hills, I shall name P. rupestris. Its specific character is subjoined. It is probable that some of the less material characters which I have added to the generic character, in order to make the description as perfect as possible, will be required to be added to the specific character of P. rupestris, when other species shall be discovered, in consequence of their not being found to be common to all.

P. rupestris. Testa longitudinaliter confertim striata, albida, subdiaphana, lineis longitudinalibus castaneis suprà et infrà picta; versus apicem piscescunt, anfracta ultimo fascià mediâ castaneâ ornato.

Var. 1. Fascià mediâ omissâ.

Var. 2. Lineis angulatis subtùs omissis.

Var. 3. Testâ totâ corneâ.

Shell sub-diaphanous, whitish, closely striated across the whorls, marked above and below with angular chestnut lines running across the whorls, and with a band of the same colour on the centre of the last whorl, purplish-brown towards the apex.

Var. 1. The same without the medial line.

Var. 2. Ditto without the angular markings underneath.

Var. 3. The whole shell horn-coloured.

The medial band in the type specimen, and in the second variety appears to be composed of arrow-shaped spots, and is only a more pronounced expression of the angular lines.

* A new genus of the Helicidæ separated by me from Helix, in consequence of the wide departure of the animal from the type of that genus.

I am preparing a description of the Carocolla above-mentioned, the animal of which, as far as this particular species is concerned, fully justifies Lamarck's separation of the genus from Helix. Since writing the above account, I have discovered a new genus of amphibious shells, inhabiting the tract between high and low water mark in the river Hooghly, the animal of which, bearing only two tentacula, differs alike from the fresh water and land genera, which are similarly circumstanced in having the eyes (or, more properly speaking, the percipient points) on the summits of the tentacula, as in the quadri-tentaculated species, instead of at their base. The discovery of two new genera, and of as many new species in Bengal, in the course of a hurried trip down the country, and in an unfavorable season, leads us to the conclusion that many other novelties in terrestrial and fluviatile conchology remain to be discovered in that province, and in the neighbouring unexplored territories of Arracan and Ava. It is to be regretted, that a species of Cyclostoma recently discovered alive at Tenasserim, and described in the Zoological Journal, as C. Perdix, was not described before death, as the keel, with which the shell is provided, gives reason to conjecture that the animal differs in some respects from the animals of other species which have been described. Persons not conversant with conchology would do well to preserve the shells, with the animals alive, in a small box, with cotton around them, in which state land-shells may be preserved for several months, and when excited by moisture, they will make their appearance, and afford instruction to observers competent to note their characters, to whom they may be submitted. I have kept numbers of species of Bulimus alive for 9 months, without many of them manifesting any inclination to come forth: and I have now by me in good health the species of Cyclostoma and Carocolla, which I collected in the localities mentioned in the early part of this paper.

Calcutta, Jan. 17, 1832.

IV.—*Examination of Minerals from Ava. By* J. Prinsep, *Sec. Ph. Cl.*

[Read 16th Nov.]

Major H. Burney has favored us with a further supply of Minerals from Ava, proving that country to be as promising a field for varieties of the earthy minerals as it has already turned out prolific in metallic ores: among the present series may be enumerated;

1.—*Asbestos*, from the crevice of a rock among the hills of *Tsa-gain*; fine silky white Amianthus, crystallized on *silicious delomite*, as it

may be called from its behaviour with tests: the colour of the latter is greyish white, with greenish yellow imbedded nodules: before the blow-pipe it is unalterable, but it hardens so as to scratch glass easily: it effervesces strongly with nitric acid, and leaves a silicious residue: the solution lets fall a small precipitate with sulphate of soda, and a more copious one with ammonia and phosphate of soda.

2.—Small hexagonal plates of *Mica;* splitting into thin plates of a dark brown colour: non-elastic: heated on charcoal, they assume a golden colour from the separation of the plates: with a stronger heat they fuse into a black enamel: resembles Häuy's *Mica Annulaire.*

3.—Crystallized and anhydrous *Gypsum.*

4.—Dark green prismatic *Hornblende*; obliquely hexahedral, with rhomboidal cleavage:—fuses with difficulty into a black enamel.

Metallic Minerals.

5.—*Quartzy Malachite;* of a light green colour: by digestion in boiling nitric acid this mineral yielded $18\frac{1}{2}$ per cent. of oxide of copper.

6.—*Black oxide of Manganese;* fracture dark grey granular earthy: exterior surface shining black and mammellated; with borax, in the blowpipe flame gave a peuce coloured glass, discriminative of manganese.

7.—*Pisiform oxide of Iron*—in dark brown balls of the size of peas: exhibiting a stellated structure on fracture: before the blow-pipe, and cupellated with lead, proved to be almost entirely composed of red oxide of iron.

8.—*Argentiferous Galena*—from a newly discovered mine near Ava: yielded on analysis $\frac{1}{3}$ per cent. of silver, with slight contamination of copper and zinc.

9.—Crystallized oxide of Lead or *Litharge.*—This mineral is believed to be new, at least it is not described in any catalogue of the ores of lead, which have been consulted.

The specimen resembles yellow micaceous schist in general appearance: it is composed of a confused aggregation of micaceous crystals of a pink-yellow colour: the interstices in some places filled with yellow earthy litharge:—and the exterior of the nodule coated with white carbonate of lead.

The analysis was effected by solution in nitric acid and precipitation by sulphate of soda, which yielded 133,5 grs. of sulphate, equivalent to oxide of lead,..... 99.

Prussiate of potash proved the existence of copper and iron, weighing..... 1.

100.

This natural litharge is readily fusible without effervescence, and resembles, in the reddish brown colour it assumes, the vitreous coat which is always remarked upon the *Dain* and *Yowetni* silver cakes from Ava: I had previously occasion to examine the composition of this substance, which I had found to consist of

Oxide of lead, ...	70.5
Oxide of antimony, ...	12.2
Oxide of copper, ...	10.0
Silver, probably entangled in the slag, ...	6.0
Earthy matter, ...	1.3
	100.

I at the time concluded, that the Burmese refiners made use of antimony and lead in refining their silver, and that a little of the artificial slag remained attached to the surface of the silver upon its being suddenly cooled before the litharge was entirely worked off. I have been assured, however, that they use a natural ore to produce the peculiar effect remarked; and if so, the mineral now under description must undoubtedly be the substance employed.

It is worthy of remark, that the Burmese assayers judge of the quality of silver by the crystallization of this coat, or rather by the crystallization of the surface of the metal itself under its protection. A star is the emblem formed upon their standard silver, which consists nearly of the proportion of 1 atom. copper (10.5) to 5 silver (89.5). It would be curious to ascertain whether this crystallization is a concomitant of other definite mixtures of the same metals. The *Kharúbát* silver, containing 5 per cent. of copper, exhibits spiral circles of litharge on its surface in lieu of the star.

10.—*Platina Ore.* In addition to our information respecting the locality of the platina ore of Ava, Major H. Burney has favored us through Mr. Swinton, with the following interesting particulars:

"I find that a good deal of the platina ore is brought from some mountain torrents or small streams, which fall into the *Kyendween* river from the westward, near a town called *Kannee;* and it is collected in a very curious manner, as Mr. Lane is informed, although he hesitates to believe the fact. The horns of a species of wild cow in this country called *T'sain*, perhaps the same as the *Nylgao* of India, have a velvet coat before the animal reaches the age of two or three years: a number of these horns are taken and fixed in the beds of the small streams, and at the close of the rainy season, when the water subsides, a cloth is put down over each horn separately; and the horns, and cloth

as well as a portion of the sand around it, are taken up together. The horns appear to collect around them a good deal of gold dust, which the streams have washed down, and with this dust grains of platina are found mixed.

The Burmese look chiefly for the gold dust, separating and bringing that alone generally to Ava ; and although Mr. Lane has often urged the men who are engaged in this trade to bring at once the whole of what they take up with the horns, he has not yet been able to persuade them to do so. These horns sell sometimes for 12 or 13 ticals a piece, and deer's horns are sometimes used instead of them.

The Burmese call platina, *Sheenthan ;* much of this ore is also found with the gold dust collected among the small streams which fall into the *Erawadi*, to the northward, in the direction of Banman."

The same officer also writes, in allusion to a newspaper notice, " I observe that some correspondent in the Calcutta Government Gazette states that *Kannee*, where the platina ore of Ava is found, is not a town, but signifies a mine. *Kannee-myoo*, or town, is well known as a place forming the assignment of the King's aunt and step mother, whom I visited on my first arrival here ; and *Kannee* certainly does not mean a mine in the Burmese language."

V.—*New Bridge over the Mússi at Hyderabad.*

Our notice of the Caramnassa Bridge in the Gleanings of last October, has, we are happy to observe, put us in possession of further materials on the interesting subject of public works. On the present occasion, the merit of the undertaking is not due to a simple individual, but to the enlightened policy of a native government. Several indications of a similar liberal system of public improvement have been manifest of late ; and that too, it must not be forgotten, after the British Government has avowed a general determination of non-interference in the internal administration of the native states. In Oude in particular, the present ministry has been forward in promoting public works : the cast-iron bridge which was sent out fifteen years ago, and which has since lain in rust and neglect on the banks of the Gúmtí, is, we understand, about to be erected over that river ; and several other bridges on the suspension principle are also in the course of preparation : an astronomical observatory, to be provided with the best instruments, has been lately established at Lakhnaõ : a survey of the country is in contemplation ; and yet all these benefits have gone hand in hand with retrenchments and reform of the civil expenditure.

Of the progress of public works at Hyderabad, we have now an opportunity of judging from the account of the completion of a handsome stone bridge over the Mússí river, communicated by Captain James Oliphant, the engineer who erected it, to the British resident at the Nizam's court, which has been obligingly put into our hands for publication. We regret, that we are unable to add any particulars of the river itself, or of the precise situation of the bridge; but we believe that it lies on the high road between the residency and the city.

" The first stone of the bridge was laid on the 15th January, 1829.

According to the original plan there were to have been eight arches, semi-elliptical, each 56 feet span, and 18 feet rise. The piers 10 feet wide, the breadth of the bridge 24 feet.

Eight arches were fixed upon, because by this division of the channel, the best foundations were obtainable for the piers; and the chief reason for the general preference of an odd number of arches was inapplicable, as it will be seen by reference to the plan, that the strength of the current is not in the centre of the channel, but at the arch next the abutment on the left bank.

By October, 1829, the whole of the piers had been raised above what was then considered high-water mark; two arches had been finished, and a third was almost completed, when the river rose to the extraordinary height shown by the dotted line in the elevation: the piers were destroyed, and the third arch fell in, the centering having been carried away.

The sudden shock must have been a severe trial to the neighbouring arch; but it stood firm, nor on examination did it appear to have sustained any damage.

In consequence of the disaster, the work was discontinued; and nothing was done till it was re-commenced 14 months afterwards, on the 21st of December, 1830.

The engineer having been alarmed at the height to which the river rose in the flood, determined to deviate so far from the original plan, as to give two feet additional rise to the two centre arches, and a proportional increase to the adjoining ones; and instead of making the approach on the left bank solid, as he at first intended, to provide additional water-way by throwing an arch across the ravine. These alterations were carried into effect, as shown in the plan.

The arch under the approach is the arc of a circle of 63 feet radius; its span 77 feet, and rise 16 feet; breadth of the road way 30 feet.

The piers and arches throughout are composed of squared granite stone, brought from a distance of from four to five miles. The spandrels are solid

to the height of the top of the cut-waters, after which they are completed with longitudinal stone walls, covered over with large stones, just under the road-way. The arch stones are five feet long at the spring, and diminish gradually to the key stones, which are 2 ft. 9. In the arch under the approach, they are six feet at the spring, and 3-2 at the crown.

During the progress of the work, it was invariably observed, that before the keys were driven, the centres had sunk $3\frac{1}{2}$ inches at the crown; and when they were struck, which was done the second or third day after the arch was finished, that there was a settling of $2\frac{1}{2}$ inches. The large arch settled $3\frac{1}{2}$ inches, and several of the long stones at the haunches cracked, which however can hardly be considered detrimental, as it is only a proof that the hollows, which would otherwise have existed, have by the fractures been filled up."

We are greatly surprized to find, from the statement furnished to the resident by Captain Oliphant, that the outlay upon this extensive structure exhibits a total of less than 95,000 rupees, or including the labour of 90 men from the corps of engineers, rupees 1,02,000, not including the repair of the damage sustained in the flood of the 22nd October, 1829. Considering the dimensions of the bridge, and the high price of labor in the Nizam's dominions, this seems exceedingly moderate: it must however be remembered, that the foundations rest upon rock, and that the granite quarries, whence the stone was extracted, are close at hand.

We have given a reduced engraving of the architectural elevation and plan of the bridge in Plate 2. figs. 3, 4, and 5, which do not require any explanation: the plan adopted of springing the voussoirs of the elliptical arches from an inclined bed on the piers, so as to rest at right angles *to the thrust of the arch*, instead of forming right angles with the curvature of the ellipse, reminds us of Mr. Seaward's elegant design for the new London bridge, wherein the advantage of such a construction is fully developed. The attempting of elliptical arches in stone, with native *mistrís*, was a work of daring, and its successful accomplishment does credit to the perseverance and abilities of Captain Oliphant.

VI.—*A Method of rectifying a Route Protraction.*

It frequently happens, that a surveyor has to protract a survey of his route between two fixed points on a map, and that when the operation is performed, he finds the work does not close, and perhaps the terminating point of his protraction either goes beyond or falls short of the

fixed one. And if the survey be hastily executed, he will probably find the *general direction* of the *line*, as given by his protraction, to be considerably at variance, with that connecting the two fixed points. To divide the error, which is generally in excess, proportionally among the smaller lines of the protraction, according to the principles of geometry; or in fact, to make the route fit in between the two fixed points, is our present purpose.

Let AB then (Plate I. fig. 2) be the two fixed points on a map; and A*a*, *ab*, *bc*, *c*B', he protracted route. (The error is apparent; in the general direction, as much as the angle BAB'; and in the direct distance, too much by the quantity BB"B'.) First, draw lines from A to each bend in the route, as A*a*, A*b*, and A*c*. Then on the line AB' lay off AB" equal to the true distance AB. Now parallel to B'c from B", draw the line B"*c*', and observe where it cuts the line A*c*; make a mark, and call that point *c*': then parallel to *cb*, draw *c*'*b*', and where it intercepts the line A*b*, mark the point *b*': proceed similarly till you find the point *a*'. Join A*a*', *a*'*b*', *b*'*c*', and *c*'B", and the route is reduced to the true distance. But we have yet to transfer this to the line AB: for this purpose, take A*a*', A*b*', A*c*', each as radius in your compasses, and from the points *a*', *b*', *c*', describe arcs cutting both the lines AB", and AB, in the points 1, 2, 3, and 1', 2', 3'. Lay off the distances 1*a*', 2*b*', 3*c*', on the arcs from 1' to *a*", 2' to *b*", and 3' to *c*": lastly, draw the lines A*a*", *a*"*b*", *b*"*c*", *c*"B, and the route is duly transferred. This method also admits of applying correction, where the protraction of the route falls *short* of the true distance.

Calcutta, 28*th Nov.* 1831. J. G.

VIII.—*Comparison of the Indus and Ganges Rivers.*

Lieutenant A. Burnes, Assistant Resident in Cutch, who lately communicated to the Bengal Government a geographical report upon the Indus, drawn up from notes and surveys made on his recent mission to Lahore, estimates the magnitude of the Indus at Tatta, a place situated equidistant from the ocean with Sikrigalí on the Ganges, as four times greater than the latter river, upon the estimation given in the GLEANINGS, III. 185, in the month of April: but it may reasonably be doubted, whether the discharge of water in the Ganges is not underrated at 21,000 cubic feet per second at Sikrigalí, since the same quantity is also estimated to flow past Benares, and that upon more accurate data, at the same season. Lieutenant Burnes thus states the chief data of the comparison.

"In the middle of April, I found the Indus at Tatta to have a breadth of 670 yards, and to be running with a velocity of $2\frac{1}{2}$ miles an hour. It happens that the banks are steep on both sides of the river in this part of its course, so that the soundings, which amount to fifteen feet, are regular from shore to shore, if we except a few yards on either side where the water is still. These data would give a discharge of 110,500 cubic feet per second, but by Buat's equations, for the diminished velocity of the stream near the bed, compared with that of the surface, it would be decreased to 93,465 cubic feet; some further deductions should be made for the diminished depth towards the shores, and 80,000 cubic feet per second may be taken as a fair rate of discharge for the Indus in the month of April. It is a source of regret to me, that I am unable to extend my observations to the river during the rainy season; but I had not an opportunity of seeing it at that period, and do not desire to place opinion in opposition to fact. I may mention however that at Sehwan, where the Indus is 500 yards wide, and 36 feet deep, and sweeping with great velocity the base of a rocky buttress that juts in upon the stream, there is a mark on the precipice which indicates a rise of 12 feet during the inundations. This gives a depth of 8 fathoms to this part of the Indus in the rainy season: if I could add the increase of width on as sound data as I have given the perpendicular rise or depth of water, we should be able to determine the ratio between its discharge at the opposite seasons; but I have only the vague testimony of the natives to guide me, and therefore dismiss the subject.

"From what has been above stated, it will be seen that the Indus, in discharging the enormous volume of 80,000 cubic feet of water in a second, exceeds by four times the size of the Ganges in the dry season, and nearly equals the great American river the Missisipi. The much greater length of course in the Indus; the tortuous direction of itself and its numerous tributaries, among towering and snowy mountains near its source, that must always contribute vast quantities of water, might have prepared us for this result; and it is not extraordinary, when we reflect on the wide area embraced by some of these minor rivers, and the lofty and elevated position from which they take their rise: the Sutlej in particular flows from the sacred lake of Manasarovara in Tibet, 17,000 feet above the sea. The Indus traverses too a comparatively barren and deserted country, thinly peopled and poorly cultivated; while the Ganges expends its watersi n irrigation, and blesses the inhabitants of its banks witn rich and exuberant crops. The Indus, even in the season of inundation, is confined to its bed by steeper and

more consistent banks than the other river, and, as I have shewn in my memoir, seldom exceeds half a mile in width; the Ganges on the other hand is described as an inland sea in some parts of its course, so that at times the one bank is scarcely visible from the other, a circumstance which must greatly increase the evaporation. The arid and sandy nature of the countries that border the Indus soon swallow up the overflowing waters, and make the river more speedily retire to its bed. Moreover, the Ganges and its subsidiary rivers derive their supply from the southern face of the great Himalaya, while the Indus receives the torrents of either side of that massy chain, and is further swollen by the showers of Cabúl, and the rains and snow of Chinese Tartary. Its waters are augmented long before the rainy season has arrived; and when we look at the distant source of the river, to what cause are we to attribute this early inundation, but to melting snow and ice.

"The slope on which the Indus descends to the ocean would appear to be gentle, like that of most great rivers. The average rate of its current does not exceed $2\frac{1}{2}$ miles an hour, while the whole of the Punjab rivers, which we navigated on the voyage to Lahore, were found to be one full mile in excess to the Indus; we readily account for this increased velocity by their proximity to the mountains, and it will serve as a guide in estimating the fall of the great river. The city of Lahore stands at a distance of about 1,000 British miles from the sea, by the course of the river; and I am indebted to the kindness of Dr. J. G. Gerard, of the Bengal establishment, for a series of Barometrical observations made at Amritser, a city about 30 miles eastward of Lahore.

The mean of 18 of these observations, gives us the height of the Barometer at.....	28.8613
The corresponding observations at Calcutta give....	29.7115
Making a difference of....	8502

"I am informed that the height of instrument registered in Calcutta may be 25 feet above the level of the sea, and as the city of Amritser is nearly on the same level as Lahore, (since both stand on the plains of the Punjab,) it must have an elevation of about 900 feet from the sea. It remains to be considered in what and how great a proportion this slope is to be distributed among the rivers from Lahore downwards. On a comparison with the Ganges, we cannot give a greater fall downwards from Mittun, where the Indus receives the Punjab rivers, than 6 or perhaps 5 inches per mile; nor can we allow more than 1-4th of the 900 feet as the height of that place about the level of the sea, for the river has not increased here in velocity of current, though we have neared

the mountains. Mittun is half-way to Lahore, and about 500 miles from the sea, and nearly 220 feet above it. The remaining 680 feet we may fairly apportion to the Punjab rivers from their greater rapidity of course, which would give them a fall of 12 inches per mile.

"It is an additional proof of the greater magnitude of the Indus, that at its lowest it retains a velocity of two and half miles with a medial depth of 15 feet, moving throughout the year in one majestic body to the ocean; while the Ganges partakes more of the nature of a hill stream, insignificant at one season and overflowing its banks at another.

"Before bringing these remarks on the Indus to a close, I wish to add a few words regarding the effect of the tide on the two rivers. In the Ganges it runs considerably above Calcutta, whereas no impression of it is perceptible in the Indus 25 miles below Tatta, or about 75 miles from the sea. We are either to attribute this occurrence to the greater column of water resisting the approach of the sea,

> 'Whose vanquished tide, receding from the shock,
> 'Yields to the liquid weight,'

or to the descent of the water of the one river being greater than that of the other; the tide in the Indus certainly runs off with incredible velocity, which increases as we near the sea. It would appear that the greatest mean rise of tide in the Ganges is 12 feet. I found that of the Indus to be only 9 feet at full moon, but I had of course no opportunity of determining the mean rise of the tide as in the Ganges. The tides of Western India are known to exceed those in the Bay of Bengal, as the construction of docks in Bombay testifies; and I should be disposed to consider the rise at the mouths of the Indus and Ganges to be much the same. Both rivers, from the direction of their fall into the ocean, must be alike subject to an extraordinary rise of tide, from gales and winds; and with respect to the whole coast of Sinde, the south-west monsoon blows so violently, even in March, as to break the water at a depth of 3 and 4 fathoms, and long before its depressed shore is visible to the navigator."

Lúdiana, Nov. 14, 1831.

VIII.—*Summary of Meteorological Observations made at the Surveyor General's Office in Calcutta, during the Years* 1829-30-31.

The monthly tables kept by the Surveyor General, and uniformly published in the Gleanings, since its commencement, are now capable of furnishing three years data for the illustration of the climate of Calcutta, as regards the pressure, temperature, moisture, rain, state of

the winds, and aspect of the sky: and as such regularity prevails in atmospherical phenomena within the tropics, there is no occasion for further delay in presenting our readers with a summary of the results, adding a few observations and comparisons with such other registers of Oriental climates as are within our reach. Meteorology is now attracting more and more attention in Europe. Societies have been established for its exclusive cultivation in some countries, and more recently at Paris, a "correspondance pour l'avancement de la meteorologie" has been undertaken by M. Morin, who not only hopes to frame a complete "histoire du tems" for the whole world, but even eventually to be able to predict the future weather of any climate from accurate analysis of the effects of past seasons: towards this laborious undertaking Mons. Morin invites assistance from all those who are in the habit of recording their observations, and we with pleasure give circulation to his proposals in return for the copy of his Essays on Meteorology, with which he has kindly favored us; but we should rather recommend, [for our own sakes no less than to save labour to M. Morin himself,] that our pages should in the first instance be made the medium of his *Indian correspondence;* and we further recommend that the tables with which we may be favored, may be abstracted by observers in a convenient form for reference and comparison, such perhaps as we have prepared on the present occasion to exemplify the climate of Calcutta. We hope hereafter to lay before our readers some extracts from the Essays of M. Morin; they abound in curious remarks upon the phenomena which he has professedly engaged to study, not only from nature, but from written authorities in all the current languages of Europe, nay even from the Chinese manuscript of *Youe-ling*, the Daniel of the celestial empire, now under translation by M. Brosset, which besides meteorological facts "contient encore beaucoup d'autres choses curièuses."

But the object of the present paper is to exhibit a tabular view of the climate of Bengal, from the registers already published in detail. These registers have been purely *instrumental*, for as M. Morin remarks there are two modes of observing the weather, one by means of fixed instruments, the other by a continual log-book of ocular observations on the formation and dispersion of clouds, force and direction of winds, influence of the ground, hills, water; of storms, lightning, auroræ, and so forth. In this department our registers are perhaps deficient, but the regularity of our seasons is such, that there is not the same interest in watching the sky as in the ever changeable tropics: it is no difficult matter here, to predict the course of seasons, and the occurrence of occasional gales and north-westers is almost the only phenomenon not restricted to stated periods in the revolution of our Indian year.

The first of the following tables comprehends the general range of the weather; the wind, the clouds, and the rain: having the same letters to denote the nature of the clouds as are applied in the monthly registers: zero denotes the absence of wind or cloud, and the degree of force or of prevalence of particular winds is shewn by the form or size of the type, appealing at once to the eye.

The south or south-easterly monsoon prevails from the spring to the autumnal equinox, and northerly winds for the remainder of the year, there are intervals of calm and variable winds at the equinoxes and solstices: the registers do not particularize storms, but two or three very severe ones have occurred in the interval under review. We may instance the storm of May, 1830, which injured so many houses in Calcutta; and the gale of November 1831, which committed such havoc in the Cuttack district. As a sample of the course and disastrous effects of these storms, we extract a description of the one last mentioned from Mr. G. A. Prinsep's recent work on Saugor Island.

"While these pages have been in the press, another inundation has occurred more destructive than that of 1823, at a period of the year when such an event was unknown in the upper part of the bay. Since the 22nd of October, the northerly monsoon seemed to be steadily set in with a cloudless sky; and the freshness of the mornings, indicating an early and a long cold season, was the common subject of congratulation among the Europeans residing in Calcutta. A depression of less than a tenth of an inch in the Barometer on the 30th excited no attention: the day was fine as usual, with very light northerly airs; but towards evening, a veil of cirrus enfeebled the sun's rays, and some heavy clouds shewed themselves in the south-east. At 8 P. M. a light puff or two from that quarter momentarily interrupted the northerly breeze, which had freshened a little, about the time that a gust from the same direction was felt in Howrah, strong and sudden, like a north-wester. At day-break, on the 31st, the sky was overcast with a drizzling rain, the wind rather fresh at N. E. and increasing: by noon it was blowing a gale, and at short intervals heavy showers succeeded each other, during the rest of the day: violent gusts after sunset reminded us of the storm in May last year. The direction of the wind was still N. E. to E. After midnight, it suddenly veered to the southward, blowing tempestuously for several hours. During the 1st, it came round to the S. W. abating in force with every fresh point of westing. The 2nd was a dull cloudy cold day, with the wind at west to N. W. but the gale had ceased: while it continued, there fell about 2 inches of rain. The Barometer indicated at its lowest ins. 29.672 at 4 P. M. on the 31st, and at sunrise on the 1st November, being only a fall of .348 with reference to the highest point at which it stood on the 29th. But the river was unusually troubled, and much damage occurred among the boats: at Mr Kyd's dock-gates, the water rose to the mark of 21 feet 6 inches* in the night tide of the 31st, having been only at 14 feet 6

* 20 feet by the river gauge reduced to correspond with his tide tables.—In the great storm of May 1823, the water only rose to the mark of 20 feet (River 18. 6) being 1 foot 4 inches above the proper level: the greatest difference was then at

inches at high water in the morning, although, when the springs came on, the highest level was only 17 feet 9 inches in the night tide of the 4th. The low-water level was raised more than 5 feet, being by the mark 13 feet, instead of 7 feet 10 inches, its proper level, in the day tide of the 1st November.

Such was the character of the storm at Calcutta, where few fallen trees exhibited signs of extraordinary violence. Indeed, it would seem to have been more sparing of its ravages here than almost in any place exposed to its influence. Hundreds of boats are said to have been lost upon the Ganges, some of them laden with Indigo; and a letter from Bancoorah reports the destruction of trees to have been very great in that neighborhood. The weather at Saugor is thus described by a gentleman residing at Ferntosh.

"30th October, 2 P. M. clouds gathering in the E. quarter—3 P. M. some drops of rain.

31st, morning, strong breeze from N. E. with light rain—increasing towards noon with heavy rain—evening, hard gale at E. and heavy driving rain—8, 30 P. M. blowing very hard from S. E. and the tide beginning to pass over the bunds of the estate—10 P. M. wind S. W. blowing a hurricane—trees and houses falling—the wooden bungalow shaking very much, and the water within a foot of the floor, which is raised between 5 and 6 feet above the ground.

1st November—wind S. W. moderating, but strong squally breezes all day from S. W. to W. S. W. without rain.

2nd—wind N. to N. W. and cloudy."

Here the gale was much more severe than that of 1823, and the water rose at least a foot higher over the land: but its greatest fury was spent in the Midnapore district, and on the unfortunate coasts of Kedgeree, Hidgelee, and Balasore. The large bunds of those coasts, behind which a numerous population slept in fancied security, were suddenly overwhelmed by a tremendous wave, sweeping away with resistless force every house and every article of property in the native villages, and destroying the paddy crops, all the cattle of an extensive tract of country, and a large portion of the inhabitants. Hundreds of cattle were seen floating past the ships at the Sand Heads. The Collector of Balasore, who with difficulty saved himself and his family, has given a frightful picture of the desolation around him—the atmosphere being infected by the carcases of men and animals, which the retiring waters had left scattered upon the ground. A letter from Cuttack, published in the newspapers, estimates the destruction of lives at 10,000, the entire population of 300 villages, which are said to have been annihilated by the waves. The inundation extended from Kedgeree as far as Cuttack, and even broke through the bunds at Culpee and Diamond Harbour, besides creating a tremendous bore of 5 feet in the Roopnarain, at Tumlook, which destroyed a great many boats and nearly all the people in them.

Saugor has been more fortunate than the opposite coast; but, although from age and the grass upon them, the bunds of all the estates were stronger, while at the same time they were in general larger than in 1823, and mostly in good repair; no part of the island has escaped inundation, except a few of the tanks—a very important exception, with reference to the time of year, and the number of persons dependent upon them for subsistence.

low water, the river level being 9 feet 3 inches, instead of 6 feet 4 inches, as it ought to have been by calculation.

Most fortunately the storm came on during neap tides: had it occurred at any time between the 2nd and 6th November, the tide would have risen three feet six inches to four feet higher at Saugor, and the frail asylum of the fallen thatch of their houses would have been swept away with most of the inhabitants. The destruction of lives would then perhaps have been as great upon the island, as it has been at Kedgeree, Hidgelee, and Balasore; and in those districts the desolation would have been awful indeed. Nor is it unlikely, that the inundation might have extended even to Calcutta, where the river would overflow its banks at less than 23 feet, (by Mr. Kyd's tide register,) which is but 3 feet above the level it attained."

By the papers it appears that a most severe hurricane was experienced at Manilla, a few days previous to this storm, and if the whole intervening space could be submitted to enquiry, a connection between the two might very probably be proved.

TABLE I.—*Winds, Rain, and aspect of the Sky, most prevalent at Calcutta, from three years' observations.*

MONTH.	SUN-RISE.		NOON.		SUN-SET.		RAIN.
	Winds.	*Clouds.*	*Winds.*	*Clouds.*	*Winds.*	*Clouds.*	*Inches.*
January..	0	0	N ne.	0 ci.	0 n.w.	0	0.00
	0 nw.	0 fogs	NW n.	0 cu.	0	0	
	0 n.e	0	NW var.	0	0	0	
February	0	morning	N var.	0 ci.	0	0	0.53
	0 ne,	fogs	NE var.	cir. cu.	n.e. 0	0 cum.	
	0 nw.	cir.	W var.	cum.	n.w. 0	0 cum.	
March ..	ne. var.	0 ci.	variable	cum.	0	0	0.74
	0	0 ci.	SW var	cum. st.	0 s.	cum.	
	se. sw.	0 ci.	variable	cum.	s.e.	cir.	
April.. ..	southerly	cum.	SW SE	cum. ci.	*SE*	cir.	4.08
	0 s.	cum.	S sw.	cum. ci.	*SE*	cum.	
	sw. se.	cir.	SE sw.	cum.	*S* var.	cu. ci.	
May.. ..	0 s.	cum.	S var.	cum.	*S* s.w.	cum.	5.78
	0 s.	var.	S sw.	cum. str.	*S* s.e.	cum.	
	0 se.	cir.	SSE	nim. ci.	*SE*	cum. ci.	
June.. ..	sw. 0	cum.	SE sw.	cum. str.	S	cum. str.	16.71
	se.	var.	*SE* var.	cum. str.	*SE*	n. ci. s.	
	s. 0	var.	S calms	cum. n.	*SE*	cum. str.	
July.. ..	sw. se.	cir. str.	SE sw.	cum. str.	sw. 0	cum. st.	8.98
	0 s.	cum. str.	var. *SE*	cir. n.	se. var.	ci. str.	
	0 se. v.	nim.	var. w.	nim. cu.	sw. var.	ci. cu.	
August ..	s.	cum. str.	SE	cum. str.	*SE*	cum. str.	10.41
	se.	cum. str.	SE s.	cum. str.	*SE* var.	cir. str.	
	s. ne.	sun. str.	SE var.	cum. str.	*S* var.	cir. n.	
September	0 se.	cum. str.	*SE* var.	cum. str.	*SE*	cum. str.	6.70
	0	cum. str.	*S* var.	cum. str.	*S* sw. se.	cir. str.	
	0 s. ne.	cir. str.	variable	cum. cir.	variable	cum. ci.	
October..	0 ne. se.	cum. ci.	*E* var.	cum.	ne. 0	cum.	5.84
	0 var.	cum.	*NE* var.	cum.	0 var.	cum.	
	0 n. nc.	0 cu.	*N* e.w.	cum.	ne. var.	cum.	
November	0 ne.	0	NE	cum.	*NW.* 0	0	0.06
	0 n.	cir.	N var.	0	var. 0	0 cu.	
	0	cir.	NE n.	cum.	0 n.e.	0 ci.	
December	0 n.	0	NE nw.	0 cu.	0 n.	0	0.00
	0 n.	0	N nw.	0 cum	0	0	
	0	0	NW ne.	0 c.s.	0 n.w.	0	

Average of Rain for three years, 59.83

Barometer and Thermometer.

The next two tables require no explanation; they shew the usual range of the atmospherical pressure and temperature throughout the year.

The registers of the Barometer have been uniformly reduced to the temperature of 32° Fahr. which greatly facilitates their application to useful purposes. The periods of diurnal manima and maxima also have wisely been chosen for observation, but it is to be regretted that the same precaution could not have been extended to the parallel hours of the night.

TABLE II.—*Mean Atmospherical Pressure in Calcutta, for* 1829-30-31.
Barometer reduced to 32° Fahrenheit.

Month.	Sun-rise.	Maximum Pressure at 9 h. 40 m.	Apparent noon.	(for 1830-31) 2h.50m. P. M.	Minimum Pressure, 4 P. M.	Sun-set.
	inches.	inches.	inches.	inches.	inches.	inches.
Jan.	30.034	30.084	30.033	30.019	29.961	29.971
Feb.	29.959	29.995	29.960	29.904	29.878	29.892
March,	.877	.922	.885	.825	.797	.808
April,	.748	.796	.763	.721	.672	.685
May,	.625	.670	.638	.579	.555	.579
June,	.526	.563	.532	.497	.468	.484
July,	.558	.591	.571	.529	.501	.520
August,	.589	.624	.599	.532	.525	.537
Sept.	.655	.700	.667	.616	.599	.609
Oct.	.796	.839	.792	.736	.729	.743
Nov.	.935	.978	.928	.875	.871	.916
Dec.	30.038	30.079	30.025	.971	.965	.978
Means	29.778	29.818	29.783	29,734	29.710	29.727

Mean of the columns of maxima and minima for three years, 29.764

TABLE III.—*Mean Thermometrical Range for the same period.*

Month.	Minimum temperature Sun-rise.	IX. 40 A.M.	Apparent noon.	Maximum temperature 2h.50m P.M.	IV. P. M.	Sun-set.
Jan.	56°.8	67°.5	73°.5	77°.5	75°.3	70°.1
Feb.	63.6	74.7	77.9	82.1	82.0	76.5
March,	72.8	80.0	84.4	86.8	86.4	81.2
April,	76.6	85.8	89.6	91.2	90.5	85.3
May,	79.9	88.4	91.3	93.6	91.4	86.6
June,	80.5	85.6	88.6	88.1	86.8	83.8
July,	80.3	84.3	85.6	86.4	85.1	82.9
August,	79.4	84.4	85.5	85.3	84.4	82.5
Sept.	79.4	84.9	86.1	85.6	84.7	82.9
Oct.	77.1	83.2	85.6	85.5	84.1	81,1
Nov.	66.7	74.8	78.8	80.1	78.7	75.4
Dec.	59.7	69.7	74.9	76.8	75.4	70.9
Means	72.73	81.11	83.49	84.89	83.57	79.86

Mean of extremes,..... 78.81
Mean temperature of the day,..... 81.26
of the night,..... 75.00
Deduced mean of the 24 hours,..... 78.13
Mean temperature of Calcutta in 1784-5 78°.0 (As. Res. IV.)

To place the relative course of the two instruments in a more convenient form for comparison, the following tabular view of their range

throughout the year has been constructed; and it derives additional utility from the parallel columns which we have been enabled to insert for other localities, so that the whole presents a convenient epitome of meteorological phenomena between 12° and 30° of north latitude. Of the climate of Madras, the minutest details are recorded in the voluminous and careful reports of the late astronomer Mr. Goldingham; whose results merely required to be reduced to the freezing point. The Ava tables are abstracted from Major Burney's registers published in the GLEANINGS; the Benares tables are taken from the Oriental Magazine, 1827: for the Seharánpúr results we are indebted to Dr. Royle, who allowed us to look through his copious registers for the purpose. As the several Barometers were never absolutely compared together, entire dependence cannot be placed upon the mean altitudes given; but with regard to Calcutta, Benares, and Seháranpúr, as some opportunities occurred of comparison through the instruments of different travellers, the relative altitude of these places can be estimated tolerably well: Thus, Seháranpúr will be found to be almost exactly 1000 feet above the sea, as was before estimated by Captain Hodgson:—Benares in like manner may be safely stated in even numbers to be 300 feet above the sea.

TABLE IV*. *Monthly Deviations of the Barometer and Thermometer from their annual mean height at Calcutta; and at several other places, introduced for the sake of comparison.*

Month.	*Barometer at 32° Fahr.*					*Thermometer.*				
	Madras mean of 21 years from 1796 to 1821.	Ava 1830.	Calcutta, for three years 1829-30-31.	Benares, four years' observations 1822 to 1826.	Seháranpúr, 1826-27.	Madras, mean of 21 years' observations max. and min.	Ava, 1830, sun-rise and 4 P. M.	Calcutta, three years' observations max. and min.	Benares, four years' observations max. and min.	Seháranpúr, 1826-27.
	inch.	*inch.*	*inch.*	*inch.*	*inch.*	*deg.*	*deg.*	*deg.*	*deg.*	*deg.*
Jan...	+.146	+.229	+.208	+.273	+.274	−6.5	−13.7	−11 6	−17.0	−21.8
Feb...	+.131	+.115	+.172	+.175	+.219	−4.5	− 4.9	− 6.0	−11.5	−20,9
Mar.	+.087	+.051	+.095	+.107	+.151	−1.8	− 2.8	+ 1.0	− 1.5	+ 0.1
April,	−.006	−.028	−.030	−.043	+.061	+0.7	+ 7.8	+ 5.1	+ 9.5	+ 6.1
May,	−.124	−.105	−.152	−.136	−.060	+5.2	+ 5.6	+ 7.5	+13.9	+11.6
June,	− 117	−.156	−.248	−.289	−.217	+7.4	+ 7.1	+ 5.5	+13.1	+17.5
July,	−.103	−.176	−.218	−.308	−.398	+3.9	+ 4.4	+ 4.6	+ 6.9	+12.8
Aug.	−.088	−.126	−.194	−.203	−.278	+3.0	+ 4.1	+ 3 6	+ 6.4	+10.0
Sept.	−.057	−.098	−.115	−.098	−.158	+2.1	+ 4.3	+ 3.7	+ 5.8	+ 9.5
Oct...	−.018	−.010	+.020	+.074	−.047	+0.1	+ 2.2	+ 2.5	+ 1.3	− 0.8
Nov...	+.006	+.102	+.161	+.181	+.209	−3.1	− 4.2	− 5.4	− 9.7	−10.8
Dec...	+.124	+.201	+.258	+.279	+.245	−4.9	−10.1	−11.5	−17.(	−13.8
Ann. mean	29.810	29.573	29.764	29.464	28.766	81.69	78.39	78.13	77.81	73.5
	.270	.405	.506	.587	.672	13.9	21.5	19.1	31.5	39.3

It will be remarked that the range of variation in the weight of the atmosphere increases with the latitude, even up to the foot of the Himalaya

mountains, and that it is accompanied by a corresponding increase in the range of the thermometer. We have elsewhere reasoned on this subject, and do not intend, in the present view of observed facts, to enter into any theoretical discussions; at any rate before doing so it is to be wished that we may be able to extend the table of comparisons to other principal points on the continent of India; it is evident that in calculating barometrical altitudes, by corresponding observations at distant places, a corrective equation must be introduced, depending on the time of year, having its maxima at the two solstices.

We now come to the *diurnal oscillation* of the Barometer, for which the same sources have furnished me with materials for framing a comparative table for five localities considerably distant from one another; we could have added Múrshedabád to the list, but that the thermometric series for that place was incomplete. At Seháranpúr the horary observations were confined to a single day, the fifteenth, of each month. At Madras to three similar days: at Benares perhaps the hour of the minimum was not always exactly observed: thus a little irregularity must be expected, but on the whole the results are wonderfully equable.

TABLE V. *Diurnal Oscillations of the Barometer and Thermometer at Calcutta, with comparative observations at other places.*

Month.	*Barometer at 32°.*					*Thermometer.*				
	Madras, max. and min. every tenth day for 1823.	Ava, 10 A. M. and 4 P. M.	Calcutta, 9 40 A.M. and 4 0 P. M.	Benares, 9 to 10½ A. M. and 4 to 6 P. M.	Seháranpúr, max. and min. of one day in month.	Madras, 4 A. M. and 2 P. M.	Ava, sunrise and 4 P. M.	Calcutta, sunrise and 2 50 P. M.	Benares, daily extremes by register thermometer.	Seháranpúr, extremes of one day in each month.
	inch.	*inch.*	*inch.*	*inch.*	*inch.*	*deg.*	*deg.*	*deg.*	*deg.*	*deg.*
Jan...	.072	.144	.123	.097	.103	11.0	9.4	20.7	17.8	24.5
Feb...	.070	.126	.117	.103	.093	10.0	16.8	18.5	19.2	21.0
Mar.	.076	.107	.125	.121	.146	7.0	20.8	14.0	20.7	26.0
April,	.081	.110	.124	.125	.107	9.0	20.9	14.6	23.2	31.0
May,	.081	.113	.115	.124	.160	9.0	20.4	13.7	21.9	38.0
June,	.092	.136	.095	.113	.178	9.0	9.0	7.6	16.1	31.5
July,	.097	.133	.090	.077	.103	7.0	6.6	6.1	9.0	15.3
Aug.	.105	.109	.099	.088	.079	7.0	8.8	5.9	8.3	11.5
Sept.	.094	.145	.101	.103	.123	6.0	7.8	6.2	10.3	13.0
Oct...	.068	.144	.110	.100	.120	8.0	5.0	8.4	18.1	31.5
Nov...	.071	.127	.107	.107	.147	8.0	6.7	13.4	16.8	29.3
Dec...	.071	.126	.114	.098	.124	9.0	8.5	17.1	16.3	17.5
Mean tide	.081	.126	.110	.105	.120	8.5	10.6	12.2	16.6	24.2

With due allowance for the difference of sensibility in the instruments, the above table shews that the average diurnal tide of the Barometer between the equator and 30° north latitude exceeds one-tenth of an inch, and that it is progressively greater as the variation of temperature during the day is also greater. With regard to the *nocturnal tide* of the

atmosphere, the Calcutta tables afford us no data, for want of an observation at 10 P. M., the hour of the supposed maximum at night; all that is indicated therein is, that the Barometer is constantly *lower* at sunset than at sun-rise. At the Madras observatory, in 1823, a series of horary observations was made for three days in each month, which seems to establish the fact of a night-tide beyond a doubt to the extent of .04 inch; when however the corrections for the temperature of the mercury are applied, this amount is reduced to two-hundredths of an inch, which is one-fifth only of the *diurnal tide.*

The same result is obtained from a month's horary observations undertaken by Col. Balfour at Calcutta, in the year 1784. We have also in manuscript a diary kept by Mr. G. A. Prinsep, during 32 days of a voyage from Calcutta to Bombay, whence it appears that upon the ocean the

Barometer	falls	from	10 P. M.	to sunrise	—.022
	rises	from	sunrise	to 10 A. M.	+.044
	falls	from	10 P. M.	to 4 P. M.	—.102
	rises	from	4 P. M.	to 10 P. M.	+.080

on the other hand, the Berhampúr register exhibits a constant *rise* from 10 P. M. to 5 A. M. but as the corresponding thermometrical register is unfortunately not in our possession, we have been obliged to substitute a correction from the means of the Calcutta register, and the results may be in some measure erroneous: they cannot however be so far from the truth as to reverse the apparent issue. At Seháranpúr also the existence of a nocturnal tide is equivocal; the following table exhibits all that we can gather towards the elucidation of the point in India, expressing by minus signs the real tide, or fall of the barometer, from 10 P. M. to 5 A. M. and vice versâ.

TABLE VI. *Nocturnal Oscillation of the Barometer from* 10 P. M. *to* 5 A. M. *reduced to* 32° *Fah.*

Month.	Madras 3 days in each month.	Berhampúr, from Dr. Russel's tables.	Seháranpúr, Dr. Royle's, observations.	Vera Cruz in Mexico by Fray Juan.
January,	—.004	+.034	—.043	+.018
February,	—.029	+.026	—.009	+.009
March,	—.026	+.069	—.008	—.002
April,	—.027	+.008	—.007	+.008
May,	—.014	+.020	—.020	+.005
June,	—.026	+.012	+.039	+.003
July,	—.009	.000	—.005	—.002
August,	—.028	+.014	—.016	—.007
September,	—.024	+.011	+.011	—.012
October,	—.033	+.009	—.004	—.021
November,	—.010	+.009	+.024	+.001
December,	—.019	+.027	+.015	—.023
Means	—.021	+.020	—.001	—.002

The last column is taken from the manuscript observations of Fray Juan, at Vera Cruz in 1817-18, in the possession of a friend: the latitude of that place, 19° N., should make the results applicable here.

There is still sufficient ambiguity respecting this second tide, therefore, to render further enquiry necessary, and it would be desirable to employ a barometer for the purpose, which should not require to have any correction applied for the temperature of the mercury; this might be easily effected by enclosing the barometer tube in an outer tube of the same length, also filled with mercury upon the surface of which the scale might float.

Hygrometry.

The Calcutta tables afford sufficient data for calculating the state of the air with respect to moisture, whenever the temperature of an evaporating surface can be converted with certainty into equivalent expressions of the more obvious phemomena of Hygrometry, such as the *tension* or relative dryness; or the absolute quantity of aqueous vapour contained in a given space.—The first of these points may be found within the limit of 2 or 3 per cent. by the tables published in the first volume of the GLEANINGS:—and the second may easily be calculated therefrom by the formulæ of Dalton or Ure.—In the following tables this has been done, and the uniformity of the results is satisfactory enough. August is the most damp month of the year to the sense; but June is the month in which the atmosphere is really loaded with the greatest weight of aqueous vapour. January is in every respect the driest season of the year, but the drought at Calcutta naturally falls far short of what is experienced at Benares and Seháranpúr, where the depression of the moistened thermometer sometimes exceeds 35 degrees.

TABLE VII. *Depression of the Wet-bulb Thermometer and deduced Tension of Vapour in the atmosphere, at Calcutta,* 1829-30-31.

Month.	Sunrise.		9 40 a. m.		Noon.		2 50 p. m.		4 p. m.		Sunset.	
	Dep.	Ten.	Dep.	Ten.	Dep	Ten.	Dep.	Ten.	Dep.	Ten.	Dep.	Ten.
January, ...	2°.3	.82	8°.4	.51	13°.1	.37	15°.9	.31	14°.4	.32	9°.3	.50
February, ..	1 .6	.87	8 .5	.56	12 .4	.44	14 .4	.38	13 .9	.39	11 .1	.47
March, ...	1 .9	.89	8 .7	.59	12 .6	.47	14 .2	.41	14 .1	.41	10 .7	.51
April, ...	1 .4	.94	8 .1	.66	11 .7	.53	13 .9	.46	12 .7	.50	8 .1	.64
May, ...	1 .8	.92	7 .3	.69	9 .8	.62	10 .8	.58	9 .7	.61	6 .0	.73
June, ...	1 .6	.92	4 .4	.78	6 .6	.71	6 .6	.73	5 .2	.76	0 .5	.83
July, ...	1 .9	.90	4 .6	.79	5 .5	.75	5 .5	.74	5 .0	.77	3 .5	.83
August, ...	1 .6	.93	4 .4	.80	5 .4	.77	4 .9	.77	4 .8	.78	3 .1	.85
September, ..	1 .7	.91	5 .3	.76	6 .5	.71	5 .8	.73	5 .2	.76	3 .8	.81
October, ...	1 .5	.92	6 .1	.71	8 .0	.65	8 .6	.63	7 .4	.66	4 .3	.79
November, ..	2 .8	.85	9 .0	.55	12 .3	.44	13 .9	.40	12 .6	.43	8 .1	.59
December, ..	2 .4	.83	7 .4	.59	10 .8	.47	12 .5	.43	11 .3	.44	6 .9	.61
Mean Tension		.892		.665		.577		.547		.570		.680

TABLE VIII. *Mean Barometric Pressure of Aqueous Vapour in the Air during the same period, deduced from Table VII, and Dalton's Table of Aqueous Tensions.*

Month.	Sunrise.	*h. m.* 9 40 a. m.	Noon.	*h. m.* 2 50 p. m.	4 p. m.	Sunset.
	inch.	inch.	inch.	inch.	inch.	inch.
January, ...	0.336	0.336	0.300	0.288	0.275	0.275
February, ..	.513	.476	.413	.407	.300	.403
March, ...	.703	.590	.546	.504	.500	.535
April, ...	.846	.792	.721	.649	.690	.755
May, ...	.904	.931	.911	.911	.902	.941
June, ...	.994	.980	.975	.985	.995	.987
July, ...	.909	.908	.900	.903	.901	.910
August, ...	.911	.920	.916	.914	.897	.926
September,..	.892	.889	.859	.869	.887	.861
October,.. ..	.840	.788	.773	.738	.760	.814
November,..	.588	.495	.449	.424	.432	.513
December, ..	.465	.456	.424	.413	.404	.485
Means, ...	751	.713	.682	.667	.669	.710

It is here observable, that besides the *apparent* drying of the air caused by the increase of heat during the day, it actually seems to become less loaded with moisture from sun-rise to 3 P. M. to the extent of about 10 per cent.: this is not easily explained without recourse to suppositious errors of the instruments or of the formulæ of calculation; for it is difficult to imagine that the vapour should rise independently of the air with which it is mingled; or if it does rise, that it should fall again so rapidly, to resume its place in the lower atmosphere on the following morning.—It might be expected à priori that where fogs prevailed in the morning, or where dew was deposited, the pressure of aqueous vapour measured in the morning would be less than in the middle of the day; and the appearance of a contrary result, if it does not point to a probability of errors in the instruments, or in the experiments upon which the calculations are grounded, tends at any rate to show that much remains to be done to explain facts, and to place this branch of meteorological inquiry upon a firm basis.

It is however some satisfaction to know that the register, kept at the surveyor general's office, is in this, as well as other respects, superior to most of those published in the scientific journals of England, where the column devoted to the hygrometer is generally a mere mass of figures convertible to no useful purpose. It is to be hoped, that all who register their observations in India will adopt the same kind of hygrometer, namely a thermometer with a bulb projecting from the scale, and covered with a wetted muslin bag. Its indications should first be carefully compared with the dry thermometer, and corrected for any errors of division. P.

IX.—SCIENTIFIC INTELLIGENCE.

1.—*Extract of a letter from Lieut. Alex. Burnes, dated Lahore, 23rd January*, 1832.

"As you will have perceived by the date of my letter, I have crossed the frontier, and am now at Lahore. An event occurred here last night, which will, I am sure, prove of interest to you—a severe shock of an earthquake. There were two distinct vibrations, the last continuing for about 10 seconds, with alarming violence. It occurred eventually at 11 P. M. after we had retired to bed, and were asleep. The door of my apartment and all the furniture were shaking with a rattling noise, when I awoke and ran into the open air. The house in which we are lodged is a most substantial dwelling of two stories, built of bricks and chunam, and the garden-house of Mr. Allard; yet it was shaken most violently.

"I am informed by the Chevalier, that earthquakes are of frequent occurrence in this city, particularly during winter; but he does not remember so violent a vibration as in the one I have just mentioned. The shock was from east to west, or rather S. E. to N. W. The lofty minarets of this city afford however convincing proof that there can have been no very violent commotion of nature in Lahore within these 200 years. The earthquakes of Kashmír are frequent, and the natives inform me that the shocks are more violent nearer the mountains.

"I should mention that the atmosphere had indicated nothing unusual before the earthquake, nor did the barometer undergo any variation before or after it. The thermometer stood at 37°; for the last 10 days it has been 4 degrees below the freezing point every morning at sun rise, a much greater depression than I had expected in the Punjab, where it rose to 102° daily when I was here last July."

2.—*Population of Allahabad.*

The following estimate of the population of the town of Allahabad was drawn up by the native officers of police, under the magistracy of G. Brown, Esq. in 1824, as an accompaniment to Major (then Captain) Irvine's map of the city; and although evidently not made with particular attention to accuracy, as the proportion of males and females sufficiently proves, yet, in the absence of a more minute census, it is worthy of being placed on record among the statements of a similar nature already published in the GLEANINGS. Contrary to custom, it is considerably in excess of the statement given in Hamilton's Hindústan, which makes the population of Allahabad, in 1803, only 20,000. The town itself does not seem to have been on the increase, but rather to have suffered in size and importance: an extensive suburb, Kydgunj, has however sprung up between it and the fort, but this is not included in the present census.

Mehala.	*Houses.*	*Mehala.*	*Houses.*	*Hindús.*	*Musulmáns.*
Púraní Nakhás,	127	Ganga Dás Chouk,	65		
Thatherí-bazar,	103	Mahájaní tola,	143		
Chouk,	100	Tripaolia,	40		
Bajaza-bazar,	45	Unchí mandei,	227	M. F.	M. F.
Raní mandei,	123	Gosain tolá,	157	1936	987
Khatrí tola,	151	Chak Mehala,	94	3136	2057
Utr-Suyia,	112				
	Total of the Kotwálí Thana,		1487	5072	3044

Mehala.	*Houses.*	*Mehala.*	*Houses.*	*Hindús.* M.	F.	*Musulmáns.* M.	F.
Badyabád,	274	Shahganj,	122				
Badshahí mandei,	388	Mahajaní tola,	125				
Múlasimganj,	315	Núr ganj,	204	2865		1425	
Pándaréba,	139	Súrj Kund,	196	6275		2767	
		Badshahí m. Thana,	1733	9140		4192	
Khuldabád,	133	Chandrí tolá,	262				
Shahajmet daireh,	299	Dúndipurá,	185	1157		889	
Bakshí-bazar,	69	Muezamá Jarhí,	174	2390		1888	
		Khuldabád Thána,	1122	3547		2777	
Nya katra,	86	Koréshipúr,	78	1236		340	
Nya bastí,	43	Bahadur ganj,	406	1090		260	
Katgarh,	173						
		Motí ganj, Thána,	786	2326		600	
Daryabád,	392	Yahiapur chhota,	39				
Mínapúr,	83	Rání mandei,	174	1849		1634	
Yahiapúr bará	253	Bhor mal,	96	3162		888	
		Daryabád, Thána,	1037	5011		2322	

Hindús,..... 25,096
Musulmáns,..... 13,135

Total population,..... 38,231
Number of houses,..... 6,165
Proportion of inhabitants per house,..... 6.2
Ratio of males to females, Hindús,..... 100 : 177
Musulmáns,..... 100 : 148
Ratio of Hindús to Musulmáns,..... 100 : 52

X.—*Proceedings of Societies.*

1.—Asiatic Society.

Wednesday, 4th January, 1832.

The Honorable Sir Charles Grey, President, in the chair.

Mons. Du Marcel was elected an Honorary Member. The Hon'bles Sir J. Franks, Sir E. Ryan, and Sir C. T. Metcalfe, Bt. were elected by ballot, as Vice-Presidents, for the ensuing year; and for the Committee of Papers, Messrs. Calder, Carey, Everest, Gordon, Mill, J. Prinsep, Tytler, Thomason, and Troyer.

Read a letter from Mons. Petit, proposing to exchange the duplicates of his Entomological Cabinet. The Society not having an entomological cabinet, were obliged to decline Mons. Petit's offer with thanks.

Reported, that the floor of the lower story was in a bad condition, upon which Mr. Prinsep was requested to examine it, and estimate what it would cost to repair the same.

Read a letter from Mr. Witsen, Secretary to the Royal Academy of Prussia, forwarding a question for Prize Essays for 1832.

The following Presents were received, and thanks voted for the same.

A description of Tamul castes, by Simon Casie Chitty.—*Presented by the Author.*

A copy of the *Inaya*, and a Persian and English Dictionary.—*Babú Ramdhan Sen.*

Transactions of the Medical and Physical Society, 5th vol.—*The Society.*

Journal Asiatique, Nos. 40, 41.—*Asiatic Society of Paris.*

The following books,—*by the General Committee of Public Instruction.*

Fatawa Alemgeri, vol. 2, 3.
Inayah, 3 vols.
Æsop's Fables, Persian.
Naya Sutra Vriti, Sanscrit.
Vedanta Sara.
Sahitya Durpan.
Daya Bhaga.
Menu Sanhita, 2 vols.
Mrichhakati.
Vikramarvasi.
Malati Madhava.
Uttara Rama Cheritra.
Mitakshara.

The Meteorological Register for October.—*The Surveyor General.*

The question proposed by the Class of Philosophy and History of the Royal Academy of Science at Berlin has reference to Oriental history, but it is to be regretted that its announcement was only made to the Asiatic Society in the year when the prize will be awarded. It is accompanied by the following remarks :

" Quoique l'étude de l'histoire orientale, grâce à la publication de matériaux précieux et aux recherches profondes de plusieurs savants distingués, ait fait de notre temps des progrès très-considérables et que l'élan que la philologie Orientale a pris récemment, n'ait pas manqué d'exercer une influence utile sur la critique de l'histoire des peuples et royaumes de l'Asie : il paraît cependant que l'organisation intérieure des peuples Orientaux, les détails de leurs institutions politiques, et les rapports mutuels des élémens dont se composent les monarchies de l'Orient, n'ont pas encore excité l'intérêt que ces objets importants réclament à juste titre. L'histoire intérieure même de l'Empire Arabe et le système d'administration que les Arabes adoptèrent pour les provinces conquises et qui est très-mémorable sous plus d'un rapport, n'a pas encore été suffisamment éclairci, quoiqu'on ait reconnu et signalé dans plusieurs ouvrages anciens et modernes l'importance des effets, souvent même salutaires, que la domination des Arabes eut pour plusieurs pays, p. ex. pour l' Egypte et l'Espagne.

" Ces considérations ont déterminé la Classe de Philosophie et d'Histoire de l'Académie Royale des Sciences de Prusse de rappeler l'attention des historiens et des orientalistes vers le développement historique du système de l'administration provinciale des Arabes, en proposant pour le coucours de l'an 1832 la question suivante :

" *Quel fut l'état de l'administration des provinces de l'Empire Arabe pendant la* " *durée de la puissance seculiére des Khalifes, c. à. d. depuis l'origine de l'Empire* " *Arabe et sa fondation par l'introduction de l'Islamisme, jusqu'a la fin du onziéme* " *siècle de l'Ere Chrètienne.*"

La Classe désire que l'administration que les Arabes introduisirent dans les provinces conquises, ne soit pas seulement discutée et exposée en général, mais qu'elle soit surtout développée par rapport aux différents pays qui furent successivement soumis à la domination des Arabes ; que la condition des habitans originaires des différentes provinces, et les rapports, tant politiques et juridiques, que religieux et moraux, dans lesquels ils entrèrent avec leurs nouveaux maîtres, soient éclaircis, ainsi que les attributions et les fonctions des gouverneurs et des magistrats inférieurs, les relations qui subsistaient entre ces magistrats et la cour des Khalifes, et les changements que ces relations subirent successivement. La Classe désire principalement qu'on répande du jour, tant sur l'organisation judiciaire des provinces Arabes et sur les formes de la jurisdiction qui s'y exerçait pendant l'époque marquée, que sur les institutions que les Arabes établirent, soit pour seconder l'administration financière, soit pour faciliter les progrès des arts et des sciences, de

l'agriculture, du commerce, et des autres branches de l'activité humaine, et sur les effets que ces institutions produisirent. Il seroit aussi à désirer, que les traces que les institutions des Arabes ont laissées dans les pays soumis à la domination des Khalifes, fussent indiquées. Enfin la Classe demande, que non seulement en général les résultats des recherches, dont on vient de préciser le point de vue et l'étendue, soient justifiées par des citations exactes des sources, mais qu'en particulier dans le cas où les concurrents pourraient puiser dans des sources manuscrites, on ajoute les textes des passages cités dans les langues originales avec l'exactitude la plus scrupuleuse.

"Les mémoires envoyés au concours devront porter chacun une épigraphe ou devise qui sera répétée dans un billet cacheté joint au mémoire et contenant le nom de l'auteur, et ne seront reçus que jusqu'au 31 Mars 1832, ils devront être écrits d'après le choix des auteurs en Allemand, ou en Francais, ou en Anglais, ou en Italien, ou en Latin. Le prix sera de 100 ducats, dont l'adjudication se fera dans la séance publique, anniversaire de Leibnitz, au mois de Juillet 1832."

2.—Medical and Physical Society,

Saturday, 7th January, 1832.—Messrs. Wood, Macnee, Christopher, and J. P. Grant, were elected Members of the Society. The Ballot was then taken for Office Bearers for the year 1832, and the following Gentlemen were elected.

J. Tytler, Esq. Vice-President.

W. Twining, Esq. Secretary and Treasurer.

C. C. Egerton, Esq. Assistant ditto and ditto.

H. S. Mercer, Esq.; John Grant, Esq.; Geo. Waddell, M. D.; Duncan Stewart, M. D.; Members of the Committee of Management.

H. S. Mercer, Esq.; John Grant, Esq.; Dr. Macqueen; Geo. Waddell, M. D.; A. R. Jackson, M. D.; Duncan Stewart, M. D.; Committee of Papers.

The following communications were then presented to the Society.

1st.—Dr. Boswell's case of Pendulous Tumors of the nose, with a drawing, by which it seems the patient must have had a most grotesque appearance, as some of the tumors hung down as low as the chin: the disease occurred in a Malay man. The tumors were removed by ligature and the knife.—2nd. An account of the varieties of East India Opium, by Dr. Smyttan, of the Bombay Service.—3rd. Dr. R. Tytler's account of a plant used by natives, to prevent the Scorpion from stinging them, with a relation of the trials made to provoke the Scorpion to sting the arm of a man while the plant was held near it. These trials were made in presence of other witnesses besides Dr. Tytler, and as far as can be judged of the experiments related, it appears that the Scorpions then used were not easily provoked to sting those who handled them; but there is no information as to whether any trials were made to irritate these reptiles when the plant, which is supposed to stupify or fascinate them, was not held near. A large blue Scorpion and a brown Scorpion were used in these experiments. A well finished drawing of the Scorpion and of the root alluded to, accompanied this communication, and two specimens of the plant, in its dried state, which is said to be of the class Syngenesia; but not being accompanied by the flower, its botanical characters cannot be exactly ascertained. A short notice of similar experiments which were made in presence of Brigadier O'Halloran, was also transmitted through the Medical Board by Mr. Playfair of Benares.—4th. Mr. Boswell's abstract of

Meteorological Register kept at Penang for the months of August, September, and October, 1831, whereby it appears that in those three months, the quantity of rain which fell on the Hill was 35.25 inches ; while in the valley, at North Beach, the quantity of rain in the same period was 25.92 inches. The thermometer was, on an average, nearly eight degrees lower on the Hill than in the valley.—5th. Two Tables, presented by the Medical Board of Bengal, shewing the number of sick and rate of mortality in the European and native Troops at the Madras Presidency, for several years.—6th. Observations on the contagious nature of Cholera, by James Hutchinson, Esq.—7th. Medical Report on the diseases at Penang, for three months, ending September 1830, with copy of cases by Mr. J. C. Boswell, Assistant Surgeon at Penang.—8th. Case of Elephantiasis of the Scrotum, with a drawing, by Dr. J. N. Casanova.—9th. An Essay on the peculiarities of the fœtal circulation, printed in the Oordoo language, by J. Tytler, Esq.—10th. A letter from Dr. Gregory Vos, of Calcutta, offering to the Society an analysis of authenticated facts relative to the contagious nature of Cholera.

Dr. Mouat's observations on the prevalence of Hepatitis at Bangalore, were then read, and discussed by the Meeting. A detail of Meteorological Observations, made at Bangalore, is prefixed to this Essay, shewing that, for a considerable period of the year, the morning temperature in a cool room is from sixty-two to seventy-four degrees of Fahrenheit, while there is often a bright sun at noon, and frequent variations of temperature from the refreshing showers of two monsoons. The climate of Bangalore, altogether, is described as excellent, conducive to rapid convalescence after acute diseases, not liable to cause a tendency to pulmonary complaints; and for the greater part of the year agreeable to the feelings of Europeans —inviting them to use active habits, often inducing them to expose themselves much in the sun. The station of Bangalore, in the Province of Mysore, between the eastern and western ghats, is described as a barren table land, at an elevation of nearly three hundred feet above the level of the sea; and surrounded by luxuriant vallies at a little distance. The prevailing diseases in the Regiment of European Dragoons, above six hundred strong, stationed at Bangalore, are stated to be Fever, Dysentery, Hepatitis, and Rheumatism. The causes of Hepatitis among Europeans are considered to be stimulant food and drink, active exertions, and exposure to the diurnal vicissitudes of temperature, &c.

Dr. Mouat concludes with observing, that Medical writers of repute have considered Hepatic diseases as endemial to certain parts of the Madras territories ; and others, particularly Dr. James Johnson, who is supported by Dr. Annesley, supposes its frequency to be attributable to the nature of the soil and seasons, causing the high medium annual average temperature which prevails in the Indian peninsula.

Dr. Annesley, besides enumerating a great variety of exciting causes, agrees with the views of Dr. Johnson, and says the greater prevalence of Hepatitis and Dysentery amongst the European Troops on the Madras, than the Bengal Presidency, seems in some degree to be owing to the greater warmth of the climate.

Dr. Mouat says, therefore Europeans residing at Bangalore may be looked upon as peculiarly subject to Hepatitis ; nor can this be accounted for, on consideration of the high prevailing temperature, since the medium range of the thermometer, as extracted from the records of the corps, would give but an annual average of seventy-four degrees of Fahrenheit, for several years past. Dr. Mouat is therefore of opinion, that the causes assigned by Dr. Johnson and Mr. Annesley for the pre-

valence of Hepatitis, so far from being correct, are positively refuted, as far as regards high temperature at this station: (as Hepatitis much affects the natives, and in a very small proportion the European women or children). The author says we must look to other sources for its frequency at Bangalore. The real cause of the prevalence of Hepatitis at paticular stations, can only be ascertained by the most careful comparison of correct data.

3.—Societe' d' Histoire Naturelle *of the Mauritius.*

January 11*th*, 1831.

Mr. C. Telfair, President, presented on the part of the Governor Sir C. Colville, the Transactions of the Royal Asiatic Society, and several other valuable works, in return for which the Society presented a copy of the Meteorological Observations made in 1827-28-29-30, by their colleague Mr. L. Geoffroy.

Upon a communication from the Reverend J. Adamson, Secretary of the South African Institution, it was mutually agreed, that a Member of one Society should be admitted to an honorary seat in the other, during his residence at the place; and further, that copies of their proceedings should be interchanged.

Mr. R. Lyall presented a collection of 598 plants made at Madagascar, with a catalogue.

Mr. Barry addressed the Society in English, on the occasion of his admission: he expatiated on the effects of terrestrial refraction, particularly on the phenomenon of *nauscopie:* M. M. Geoffroy, Lyall, and Faraguet, were nominated a commission to examine his memoir.

Mr. L. Bonton presented a specimen of eagle wood (Aloexylon, Agallochum de Loureiro.)

Mr. Faraguet described several curious objects met with on his voyage of discovery in the *Astrolabe.*

Mr. Desjardins, Secretary, read a description of some Sumatra fish; as well as of two species prevalent in the Mauritius. Mr. Leguitte presented a preserved specimen of a puppy, with six feet, which lived for several days.

Seeds of a *tetile* plant of Diego were forwarded by Mr. Hockyns, from which excellent cordage was made by Captain Pole of the Maidstone.

Corresponding Members proposed. *Mr. Priée, directeur du jardin botanique de Pondicherry*, and *the Baron du Ferussac of Paris.*

8th February. Mr. A. Lyall continued his verbal observations on the manufacture of sugar. He objected to the employment of the coral lime for the purification of the syrup, and recommended the substitution of the Madagascar stone-lime.

Mr. Telfair explained, that the stone-lime of Bristol had been used without much difference of effect.

Mr. L. Bonton read a note upon the posthumous work of Mr. Thouin, entitled "*Cours de culture et de naturalization des vegetaux.*"

The Secretary read a paper by Mr. G. Longmore on the subject of the replacing of one of the extreme points of the base laid down by Lacaille in 1753, on the plain of *Fort Blanc.*

Messrs. Delisse and Lyall were appointed a commission to examine some minerals received from Mr. Cameron of Madagascar.

Mr. J. Desjardins read a note on the zoological part of the voyage of the *Uranie*, pointing out a few errors in the account of the vertebral animals of the Mauritius.

The President presented Mr. Chaix's work on artesien wells, &c.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of January, 1832.

Day of the Month.	Minimum Temperature observed at Sun-rise.					Maximum Pressure observed at 9h. 50m.					Observations made at apparent Noon.					Max. Temp. and Dryness observed at 2h. 40m.					Minimum Pressure observed at 4h. 0m.					Observations made at Sunset.				
	Barometer reduced to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.
1	29,940	61,5	1,8	cm.	cl.	,975	73,	4,3	cm.	cl.	,927	77,5	7,	s. w.	cu.	,879	81,3	10,6	s· w.	cl.	,777	79,5	10,	s. w.	ci.	,851	76,5	5,6	cm.	cu.
2	,885	65,2	2,	n.	cis.	,946	69,3	6,6	n	cu.	,890	72,3	9,4	n.	do.	,842	73,7	9,5	n.	ci.	,842	75,7	12,7	w.	cu.	,846	69,7	7,2	n.	cl.
3	,991	53,3	2,5	cm.	cl.	,035	61,5	6,3	do	cl.	,996	64,	10,3	do.	cl.	,906	67,7	11,7	do.	cl.	,897	67,	11,3	do.	cl.	,905	63,7	9,2	do.	do.
4	,969	51,5	2,	n.	do.	,024	60,7	5,8	n.w	do.	,982	66,4	9,9	n.w.	do.	,930	67,2	11,3	n.w.	do.	,928	67,	10,8	n.w.	do.	,928	64,5	8,3	n.w.	do.
5	,986	50,7	1,	cm.	do.	,044	61,	6,8	do	do.	,973	66,	9,8	do.	do.	,938	67,7	10,8	do.	do.	,931	67,3	10,5	do.	do.	,931	64,3	7,8	do.	do.
6	,982	53,3	2,1	do.	do.	,046	61,7	4,8	do	do.	,010	67,3	9,4	do.	do.	,939	70,3	12,6	do.	do.	,933	68,7	11,8	do.	do.	,945	66,3	11,4	cm.	do.
7	30,014	52,5	1,7	do.	do.	,045	64,5	7,6	cm	do.	,000	69,3	12,6	n.	do.	,936	73,5	15,6	n.	do.	,936	71,3	14,4	n.	do.	,952	66,2	7,7	do.	do.
8	29,987	52,3	1,2	do.	do.	,046	66,7	7,5	do.	do	,014	70,3	10,4	do.	do.	,963	73,3	10,8	do.	do.	,962	72,5	10,3	do.	do.	,976	70,3	8,6	do.	do.
9	30,013	55,	1,3	do.	do.	,060	67,7	6,	do.	do.	,999	74,5	10,6	do.	do.	,947	76,7	10,8	do.	do.	,913	75,7	11,8	do.	do.	,961	72,	7,6	do.	do.
10	,057	58,5	1,1	do.	cu.	,111	70,3	4,1	do.	do.	,057	77,	10,8	do.	cu.	,009	76,5	9,5	do.	cus.	,008	76,	9,5	do.	cus.	,022	74,5	7,4	do.	cis.
11	,042	60.3	1,4	n.	do.	,094	69,5	7,4	n	do.	,036	75,5	12,	do.	cl.	,985	77,7	14,7	do.	cl.	,985	75,5	13,3	do.	cl.	,991	72,	9,8	n.	cl.
12	,011	55,5	1,6	cm.	do.	,058	68,7	10,5	n. e.	do.	,008	74,	15,	n. e.	do.	,929	76,5	14,3	n.w.	do.	,927	75,5	13,6	n.w.	do.	,977	70,3	7,1	cm.	do.
13	29,987	58,3	1,4	o.	do.	,017	69,	9,2	n.	cu.	,975	71,7	12,8	n.	cu.	,906	72,8	14,3	n.	cu.	,903	73,	14,3	n.	ci.	,908	69,5	9,3	do.	do
14	30,014	54,3	3,4	do.	do.	,074	65,5	12,	n. e.	cl.	,048	70,7	15,8	n. e.	cl.	,982	72,7	14,8	do.	cl.	,973	72,3	14,4	do.	do.	,972	66,5	7,6	do.	do.
15	,061	52,5	3,	do.	do.	,129	63,5	9,6	do.	do.	,092	68,7	12,9	do.	do.	,024	71,	13,5	n. e.	do.	,018	70,3	14,	n. e.	do.	,019	66,6	9,4	do.	do.
16	,075	49,8	2,6	do.	do.	,135	62,3	10,8	u.	do.	,092	67,	12,	n.	do.	,029	70,6	14,4	n.	do.	,025	70,	13,5	n.	do.	,028	67,7	12,2	do.	do.
17	,060	50,7	2,8	do	do.	,115	62,	8,	do.	do.	,064	69,3	13,	do.	do.	,011	72,3	17,5	do.	do.	,010	71,5	16,8	do.	do.	,016	67,3	13,6	do.	do.
18	,083	52,	4,3	do.	do.	,139	60,7	8,5	do.	do	,067	69,5	12,6	do.	do.	,007	71,7	13,5	do.	do.	,006	70,7	14,5	do.	do.	,018	67,8	12,3	n.	do.
19	,058	50,7	3,2	cm.	do.	,105	60,5	7,3	n.w.	do.	,055	67,3	11,3	u.w.	do.	,989	70,7	13,	n.w.	do.	,977	70,7	13,5	n.w.	do.	,977	66,7	10,7	n.w.	do.
20	29,995	51,3	3,1	n.	do	,052	62,3	8,6	cm.	do.	,011	68,	11,8	n.	do.	,945	71,7	15,	n.	do.	,940	70,7	14,	n.	do.	,948	66,5	10,	n.	do.
21	30,023	51,5	3,1	cm.	do.	,086	63,7	9,	n.w.	do.	,041	69,	13,5	n.w.	do.	,991	72,3	15,8	n.w.	do.	,991	72,	15,8	n.w.	do.	,004	67,7	11,5	n.w.	do.
22	,102	51,3	1,8	do.	do.	,160	63,5	7,4	do.	do.	,117	71,5	11,5	do.	do.	,053	72,7	13,	do.	do.	,052	72,	10,	do.	do.	,068	69,3	9,4	cm.	do.
23	,103	53,	1,3	do.	do.	,143	63,	6,3	cm.	do.	,095	72,3	10,6	w.	do.	,004	74,7	14,8	w.	do.	,993	74,	14,8	w.	do.	,006	69,7	9,9	do.	do.
24	,040	51,3	1,8	do.	do.	,081	64,7	7,8	w.	do.	,005	72,7	13,2	do.	do.	,943	73,5	14,	do.	do.	,940	72,3	13,1	do.	do.	,955	66,6	7,1	do.	do.
25	,003	54,	2,1	do.	do.	,045	65,5	8,3	cm.	do.	,980	72,7	13,	do.	do	,919	75,5	13,8	do.	do.	,900	73,7	14,	do.	do.	,924	69,6	8,1	do.	do.
26	,001	51,5	1,3	n. e.	do.	,061	63,5	9,8	n. e.	do	,005	75,	15,1	n. e.	do.	,919	77,5	15,8	n. e.	do.	,919	76,	15,8	n. e.	do.	,936	70,5	8,	do.	do.
27	29,974	55,	1,8	cm.	do.	,035	67,7	9,2	w.	do.	,986	76,	13,8	w.	do.	,916	77,7	16,2	w.	do.	908	76,3	13,8	w.	do.	,916	69,3	6,1	do.	do.
28	,961	56,7	2,	do.	do.	,020	67,	7,1	nw.	do.	,963	75,5	13,	n. e.	do.	,904	77,3	15,1	n.w.	do.	,892	76,	13,5	n.w.	do.	,917	72,3	7,8	do.	do.
29	30,013	55,5	1,3	do.	do.	,078	70,7	7,5	cm.	do.	,052	78,	13,6	w.	do.	,979	81,3	13,1	w	do.	,978	80,3	16,4	w.	do.	,977	73,3	7,8	do.	do.
30	29,991	64,3	2,1	n. e.	do.	,056	69,5	5,7	w.	do.	,028	77,3	16,1	n w.	do.	,943	81,6	16,1	s. w.	do.	,939	80,7	16,2	s. w.	do.	,945	74,5	8,	do.	do.
31	30,050	57,7	2,5	m.	do.	,107	68,	11,5	n.w.	do.	,053	74,5	18,3	do.	do.	,994	78,	19,8	n.w.	ci.	,980	77,7	18,5	n.w.	ci.	,995	74,7	14,	do.	ci.
Mean	30,015	54,6	2,1			,071	65,5	7,7			,020	71,6	12,3			,956	74,1	13,7			,949	73,3	13,7			,962	69,2	9,0		

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy; cl. clear; rn. rain, ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*

Land Shell from Rajmahal hills.

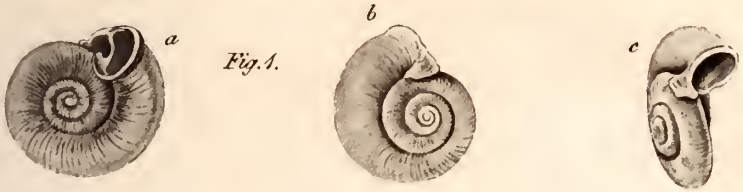
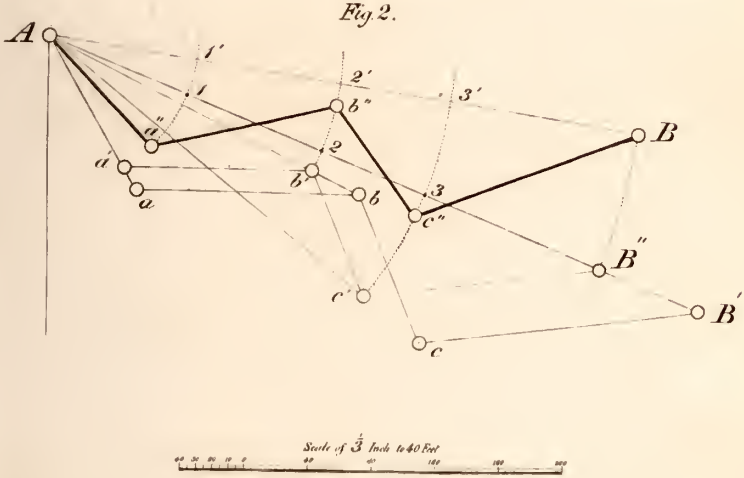


Fig. 1.

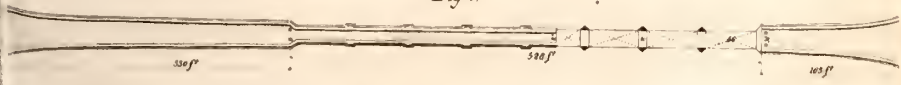
Fig. 2.



Scale of $\frac{1}{3}$ Inch to 40 Feet

Fig. 1.

Fig 2.



Hyderabad Bridge

Fig. 3.

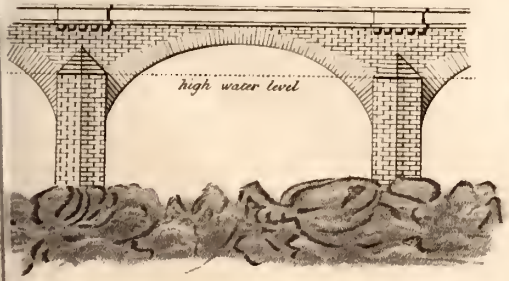
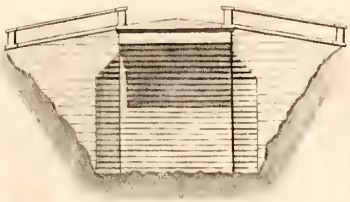


Fig 4.



Section